GE Energy

Masoneilan* Products
ValVue* FF (Rev B)
Maintenance Manual

ValVue-FF is a software tool to configure, calibrate, and operate FOUNDATION Fieldbus pneumatic control valve positioners.

imagination at work

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Software is warranted for ninety (90) days from delivery.

This instruction manual applies to the following instruments and approved software: FVP110* Digital Positioner and ValVue* software.

The FVP110 positioners are warranted for use only with interface software approved by GE Energy. Consult factory locations for approved software listing.

About this Guide

This instruction manual applies to the following instruments and approved software:

- ❑ ValVueFF
  - ❑ with Firmware version 3
  - ❑ with ValVueFF software 2.32 or greater
  - ❑ with ValVue version 2.4 or greater

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ValVueFF Software Interface to FVP Safety Information

1

This section provides safety information including safety symbols that are used on the FVP110 and the safety symbol definition.

Safety Symbols

Instructions contain **WARNINGS**, **CAUTIONS** labels and **Notes**, where necessary, to alert you to safety related or other important information. Read the instructions carefully before installing and maintaining your instrument. Total compliance with all **WARNING**, and **CAUTION** notices is required for safe operation.

WARNING

Indicates a potentially hazardous situation, which if not avoided could result in serious injury.

CAUTION

Indicates a potentially hazardous situation, which if not avoided could result in property or data damage.

NOTE

Indicates important facts and conditions.

Product Safety

This software is intended for use with Masoneilan FVP positioners only.

For positioners intended for use with industrial compressed air: Ensure that an adequate pressure relief provision is installed when the application of system supply pressure could cause peripheral equipment to malfunction. Installation must be in accordance with local and national compressed air and instrumentation codes.

General installation, maintenance or replacement

- ❑ Products must be installed in compliance with all local and national codes and standards by qualified personnel using safe site work practices. Personal Protective Equipment (PPE) must be used per safe site work practices.
- ❑ Ensure proper use of fall protection when working at heights, per safe site work practices. Use appropriate safety equipment and practices to prevent the dropping of tools or equipment during installation.

Intrinsically Safe Installation

Products certified for use in intrinsically safe installations *MUST BE:*

- ❑ Installed, put into service, used and maintained in compliance with national and local regulations and in accordance with the recommendations contained in the relevant standards concerning those environments.
- ❑ Used only in situations that comply with the certification conditions shown in this document and after verification of their compatibility with the zone of intended use and the permitted maximum ambient temperature.
- ❑ Installed, put into service and maintained by qualified and competent professionals who have undergone suitable training for instrumentation used in such areas.

WARNING *Before using these products with fluids/compressed gases other than air or for non-industrial applications, consult GE. This product is not intended for use in life support systems.*

WARNING *Do not use damaged instruments.*

WARNING *Installation in poorly ventilated confined areas, with any potential of gases other than oxygen being present, can lead to a risk of personnel asphyxiation.*

Use only genuine replacement parts which are provided by the manufacturer, to guarantee that the products comply with the essential safety requirements of the European Directives.

Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the product.

This product is not intended for use in safety shutdown systems. Substitution of parts and components can lead to unsafe operation or compromise performance.

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Introduction to ValVueFF and FVP

2

Overview

ValVueFF is a software tool that enables you to configure, calibrate, and operate FOUNDATION Fieldbus pneumatic control valve positioners with internal process control and limit switches. ValVueFF is compatible with Masoneilan Model FVP110 by and Model YVP110 by Yokogawa Electric Corporation. It fully supports FOUNDATION Fieldbus specifications.

ValVueFF Specifications

Table 1 ValVueFF Version 2.32 Specifications

Dynamic	ValVueFF Version 2.32
Compatible OS	Windows 2000 Windows XP SP2 Window Server 2003 with Service Pack 1 or Window Server 2003 R2
Interface Cards Supported	NI-FBUS ISA bus card NI-FBUS PCMCIA card
Application Interface Software	NI-FBUS Communication Manager version 4.X. ftp://ftp.ni.com/support/ind_comm/fieldbus/ni-fbus/ communications_manager
Connection	Directly connected to segment. NI-FBUS HSE (High Speed Ethernet) device.
Positioners Supported	Model FVP110 by Masoneilan Model YVP110 by Yokogawa Electric Corporation

Table 1 ValVueFF Version 2.32 Specifications (Continued)

Dynamic	ValVueFF Version 2.32
Blocks Supported	Resource Block (RB) Transducer Block (TB) Analog Output Block (AO) Digital Input Block (DI1, DI2) Control Block (PID) Output Splitter Block (OS)
Companion Device Model	FVP110 or Model YVP110
Configuration Capability	Device tag, node address, block tag, TRANSDUCER BLOCK (TB) parameters, AO and PID
Query Capability	All block parameters
Trending	Up to 12 hours trending provided.

Installation of Hardware and Software

3

Getting Started With ValVueFF

The following tools and software are needed:

- ❑ ValVueFF software version 2.32 CD-ROM
- ❑ Windows 2000, Windows Server 2003 or XP operating system
- ❑ National Instruments AT-FBUS or PCMCIA-FBUS interface card and NI-FBUS software version 4.X. Earlier versions of NI-FBUS software are NOT compatible with ValVueFF version 2.32.
- ❑ Instruction manuals for NI-FBUS interface card and software
- ❑ Model FVP110 or Model YVP110 positioner installed on a valve
- ❑ Model FVP110 or Model YVP110 Instruction Manual
- ❑ FOUNDATION Fieldbus power supply and power conditioner, with terminators
- ❑ Additional fieldbus devices that are installed on the bus segment, optional
- ❑ Fieldbus Foundation Application Guide AG-140; recommended Fieldbus Foundation reference
- ❑ Fieldbus configurator software and instructions

Before installing the ValVueFF software, you must install the Foundation Fieldbus communications hardware and software. To help to reduce the need for digital communications terminology, refer to an example reference process and Foundation Fieldbus segment in Figure 1.

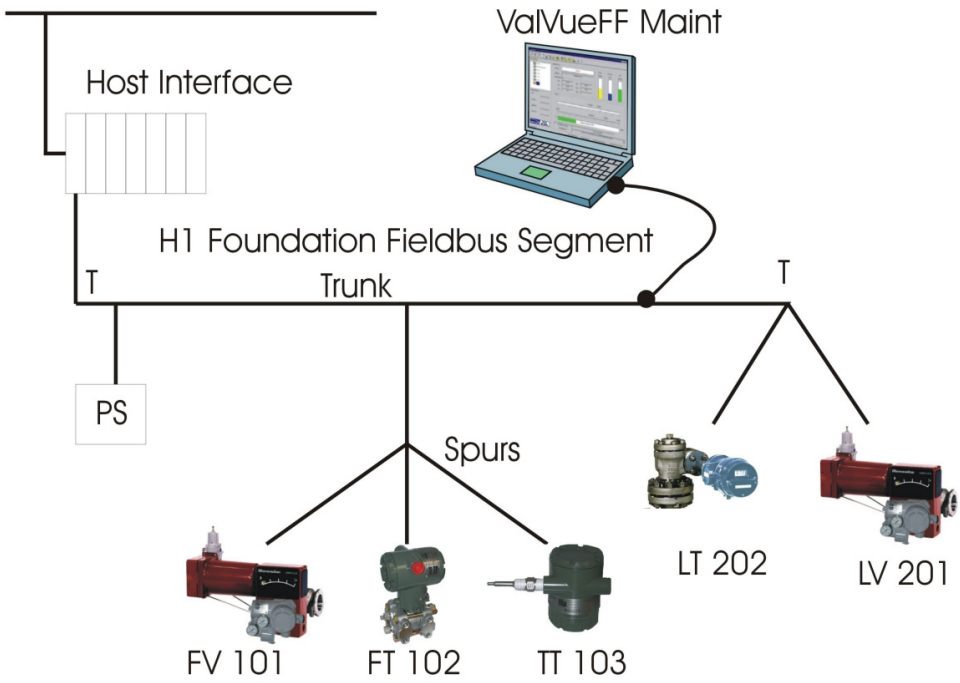

Figure 1 ValVueFF Reference Model Fieldbus Segment

CAUTION *Improper setup can interfere with process control.*

Throughout this instruction manual we use a simplified Fieldbus Reference Model Process. This is an example of a simple process, not a practical process, that illustrates many required Foundation Fieldbus elements for a successful installation. “Reference Model Process” on page 212 contains a description of the model.

General Installation and Setup Procedure

This manual details the use of ValVueFF software with a Masoneilan FVP valve positioner. ValVueFF can be used offline but is normally connected to a FVP positioner. Ensure the following guidelines are adhered to prior to using ValVueFF with a positioner:

1. Install the positioner on a valve and connect it to an air supply. See the FVP Instruction Manual.
2. Setup and start NIFB Communications Manager software.
3. Install a National Instrument AT-FBUS or PCMCIA-FBUS interface card (NI FBUS Interface) and configure it in the Windows registry. Carefully follow the installation instructions provided with the interface card.
4. Use the NI FBUS Interface Configuration Utility to configure the interface card as a Visitor. The only exception is when using ValVueFF in a PC for initial setup of a positioner without a host device; configure the NI FBUS Interface as a Link Master Device at fixed address 0x10.
5. Assign the positioner a fieldbus node address and a device tag. Do this while the device is connected as a single device on a test segment, not while connected to an operating control segment as this requires a different interface card configuration. See *Configure the NIFB Interface Card Safely for Different Tasks*.
6. Configure the entire fieldbus segment with all required function blocks soft-wired and scheduled.

Wiring practices for Foundation Fieldbus differ significantly from 4 to 20 ma instrument wiring. Refer to the *Foundation Fieldbus Application Guide 31.25 kbits/s Wiring and Installation, AG-140,* Revision 1.0 or later. However, some information regarding wiring of the devices is included.

NOTE

Visitor devices cannot start until they are connected to a running segment with an active LAS that can assign a node address to the visitor.

Wiring Requirements

There are cable requirements that must be adhered to for reliable installations. The cable used must support the digital data signals without reflections, noise, or attenuation. There are three qualities of cable specified in Fieldbus Foundation AG-140. The type A cable is used whenever possible and especially for long transmission distances or for segments with many branches (spurs).

Power Conditioner	Use a power conditioner for each segment. The conditioner must be Foundation Fieldbus compliant. The power conditioner functions to isolate the digital signals from the power source.
Power Supply	The FVP positioner complies with the foundation specification voltage requirements of 9 to 32 V. The power supply must conform to these requirements with consideration for the current drawn by all devices powered by the segment. The FVP maximum current consumption is 17 mA.
Terminator	Every fieldbus segment requires two, and only two, approved terminators. Terminators are passive circuits that damp signal reflections in the circuit. See AG-140 for the rules for terminator location. For simple segments having short runs and few spurs the terminator location can be at each end of the longest cable. For very short cables both terminators can be located in the power supply.

Installing NIFB Software and Hardware

ValVueFF software interfaces to the fieldbus segment through the requires PC interface card. The card is supplied with NI-FBUS installation software. ValVueFF is designed to operate only with National Instruments NI-FBUS cards. There is an ISA bus card for desktop computers (ATFBUS) and a PCMCIA card for notebook computers (PCMCIA-FBUS) and installation differs. There are two NI configuration tools that serve separate purposes:

- ❑ NI-FBUS Interface Configuration Utility - This is used to install and set up interface boards. It provides access to IRQ and memory settings needed for Windows. It provides tools for importing DDs. It is described in the Getting Started manual supplied with the NI-FBUS interface card.
- ❑ NI-FBUS Fieldbus Configuration System -This is the tool for configuring the Foundation Fieldbus network, including the devices, setting up the control strategy, and schedule. It is described in the NI-FBUS Configurator User Manual installed in the program online help. After opening the NI-FBUS Fieldbus Configuration System. Select **Help > Online Help** to open the manual in PDF format.

NI-FBUS Software

Install the NI-FBUS software before installing the PCI-FBUS hardware. If you do not have a this software you can obtain a copy at the following URL

ftp://ftp.ni.com/support/ind_comm/fieldbus/ni-fbus/communications_manager

CAUTION

If you are reinstalling the NI-FBUS software over an existing version, write down the board configuration and all port configuration parameters that have been changed from their defaults. Reinstallation causes you to lose all board and port configuration information.

Installing NI-FBUS 4.X Software

1. Log in as an Administrator or as a user having Administrator privileges.
2. Insert the NI-FBUS CD-ROM. If you do not have this CD-ROM you can download it.
3. Select **Start > Run**.
4. Type the following in the *Run* dialog box: *X:\Setup....*where *X* equals the letter of the drive where the NI-FBUS CD-ROM was inserted.

   The interactive setup program takes you through the necessary install steps. At the end of the setup the *Add New Board* dialog box may appear. If you have not yet installed this board select **Cancel**. The board is installed later in the setup. The installation program copies:

   - *nifb.dll* and *drvintf.dll* into the *\system 32* directory.
   - *nifb.sys* into the *\drivers* directory.
   - information to the WIndows registry.

Installing the Interface Card

Refer to the NI-FBUS Installation and Configuration manual to install and configure the PCI-FBUS board and complete all installation and configuration tasks. NIFBUS manuals are accessed using the following path: *Programs\National Instruments\NI-FBUS\Manuals*.

Table 2 Two Configurations of the NIFB Interface Card

To service a positioner in a running Foundation Fieldbus segment with a host computer.	The NIFB Interface card must be configured as a Visitor device.
To configure a positioner, prior to connecting it to a running segment.	The NIFB Interface card must be configured as a LINK MASTER DEVICE at a FIXED address. 0x10 is recommended

Configuring the Interface Card

The configuration of a PC for use with ValVueFF varies depending on the immediate task. If ValVueFF is used to maintain or configure a valve on a working Foundation Fieldbus segment, the PC running ValVueFF must configured carefully so it does not interfere with control communication. Two configurations are described in:

- ❑ “Configuring the Interface Card for Offline Use” on page 12
- ❑ “Configuring a Device with Third Party Software” on page 14

When an FVP positioner is running on a segment that cannot be disturbed, the interface card and PC are configured as a BASIC DEVICE at a Visitor address. Open the configuration utility, NI-FBUS Interface Configuration Utility, and follow the instructions in the NI manual.

Configuring the Interface Card for Offline Use

The visitor configuration, described previously, does not work if the only devices that are connected to the segment are a FVP positioner and an NIFB interface card. This is because there is no Link Master to schedule messages. It is necessary to configure the interface card as a Link Master. The Interface Name and Device Tag can be any convenient names. The names are not seen by any other interfaces and are not important.

Installing the Device Descriptions with NI-FBUS Interface Configuration Utility

The NI-FBUS Interface Configuration Utility *must* be used to install the DD for the FVP and to install the standard dictionary:

1. Select **Start > Programs > National Instruments > NI-FBUS > Utilities > Interface Configuration Utility** and the window appears (Figure 2).

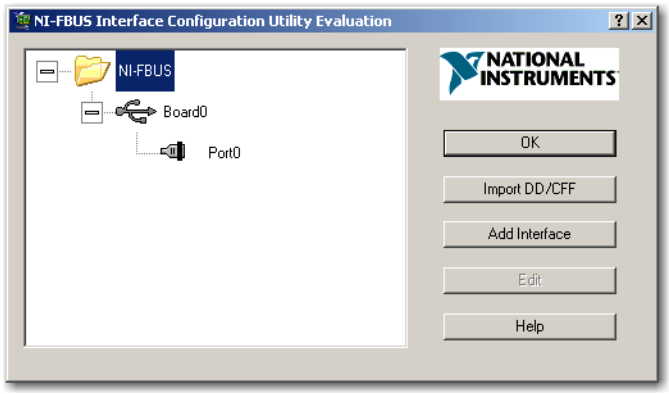

Figure 2 Interface Configuration Utility

2. Select **Import DD/CFF** and the browse dialog appears (Figure 3).

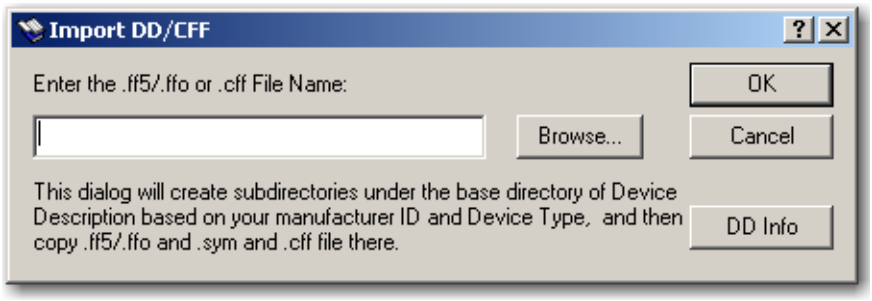
Import DD/CFF
Enter the .ff5/.ffo or .cff File Name:
OK
Browse...
Cancel
This dialog will create subdirectories under the base directory of Device Description based on your manufacturer ID and Device Type, and then copy .ff5/.ffo and .sym and .cff file there.
DD Info

Figure 3 Import DD_CFF Browse Dialog

3. Click **DD Info** and the dialog appears (Figure 4).

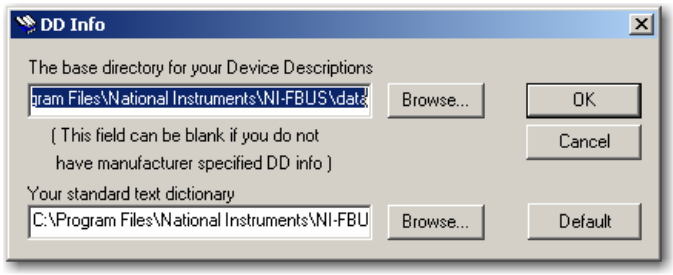

Figure 4 DD Info Dialog

4. Click **Browse**, navigate to the ValVue installation directory. Default is *Program Files\DFC\ValVueFF\DD* and click **OK** and **OK** and Figure 5 appears.

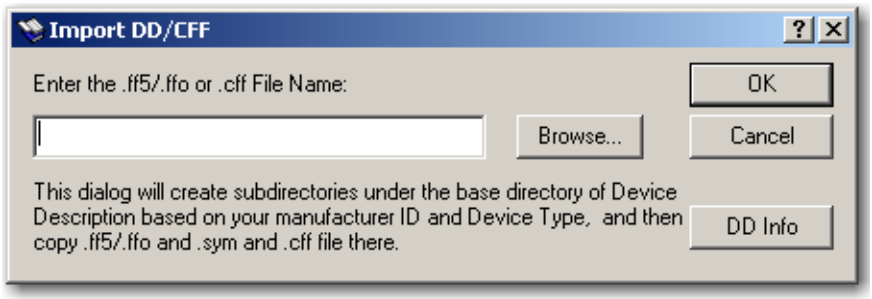
Import DD/CFF
Enter the .ff5/.ffo or .cff File Name:
OK
Browse...
Cancel
This dialog will create subdirectories under the base directory of Device Description based on your manufacturer ID and Device Type, and then copy .ff5/.ffo and .sym and .cff file there.
DD Info

Figure 5 Import DD_CFF Browse Dialog

5. Click **Browse**, navigate to the ValVue installation directory. Default is *Program Files\DFC\ValVueFF\DD\FVP* until the directory *FVP_0001* and *FVP_0007* appears. There are three files in the two directories.
6. Select the **0201.ffo** file that is under *FVP_0001*.
7. Select **Open**.

8. Select **OK** in the *Import DD_CFF Browse Dialog* and click OK and a dialog appears (Figure 6).

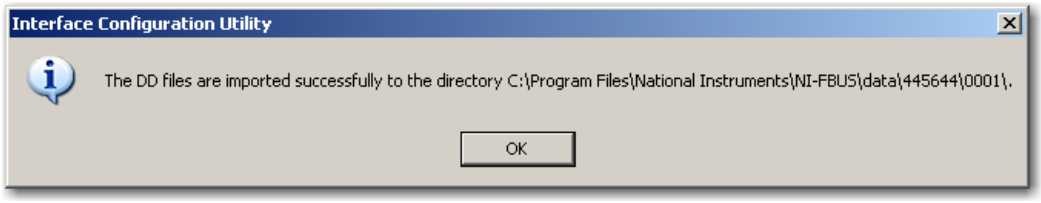
Interface Configuration Utility
The DD files are imported successfully to the directory C:\Program Files\National Instruments\NI-FBUS\data\445644\0001\.
OK

Figure 6 Interface Configuration Utility Success Dialog

9. Click **OK**.
10. Repeat step 4 through step 9 to import *0306.ffo*.
11. Repeat to import DD file in *\\Program Files\\....\DD\YVP*.
12. Click **OK** to exit.

    After the DDs are installed successfully, they appear in the installation subdirectory of NI-FBUS.

CAUTION

The computer and the NIFB interface card with NIFBUS server software configuration must not conflict with an operating Foundation Fieldbus segment. Disruption of control can result. Do not configure the interface as a Link Master.

Configuring a Device with Third Party Software

Fieldbus segments have many devices. Each segment is unique and requires configuration of the communications and control parameters. Each segment must have a Link Master that is configured to manage and schedule the communications. The National Instruments configurator software provides structured access to the parameters. In this instruction manual screen shots from the National Instruments, Inc. configurator, *NIFBUS Configuration System*, version 4.0 are referenced.

Configuring a Valve in an Active Foundation Fieldbus Segment

Because testing a segment can be time consuming it is best to perform the configuration in a disciplined series of steps. This avoids repeating or repairing configuration steps. You can refer to the NI-FBUS Configurator User Manual for additional information.

Sequencing for Configuration

Use this procedure for sequencing a configuration

1. Set network parameters for *Slot time*, *Max Response Delay*, and *Inter PDU Delay*. Parameters examples used in the reference model are shown in Table 3. Settings are different in each Foundation Fieldbus segment.

Table 3 Network Parameters for Reference Model

	Tag	FV 101	FT 102	TT 103	LV 201	LT 202	Network Setting Rule	Network Setting
	Type	**FVP**	**EJA**	**YTA**	**FVP**	**DLT**		
Sub Index	Element							
1 ST	Slot Time	4	4	4		4	Greatest of each Slot Time	4
3 MRD	Max Response Delay	12/ST	3	3		3	Greater than 12/ST	3
6 MID	Min Inter PDU Delay	4	4	4		4	Greatest of each Min Inter PDU Delay	4

2. Save the *as-found* configuration.
3. Set node addresses.
4. Assign addresses to the basic devices.
5. Set tag names to unique values.
6. Link function blocks.
7. Schedule the function blocks.
8. Download the configuration to the devices.
9. Check **Clear Devices** option in *NIFB Configurator* download dialog box to remove bad links.
10. Save a file of the configuration data.
11. Set the devices to their normal states.

Shutting Down ValVueFF

Always close ValVueFF before closing NIFB.

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ValVueFF Administration

4

Overview

This section describes the procedures for installing ValVueFF software. The ValVueFF installation procedures require a working knowledge of Microsoft Windows, the Masoneilan FVP positioner, Foundation Fieldbus communications and function block technology. For additional information about the FVP positioner, see Masoneilan FVP Instruction Manual (GEA19791_FVP110_IOM).

Administration

ValVueFF Administration, ValVueFF Help, and the FVP Device Instruction Manual are also installed along with ValVueFF. After successful installation of ValVueFF software, the System Administrator should:

- ❑ Change the default logon and password.
- ❑ Set up user accounts through the ValVueFF Administration program.
- ❑ Secure the ValVueFF CD-ROM in order to provide system security. Anyone with access to the setup disk could reload the software and thereby get access to FVP devices.

Installation Sequence

1. Remove existing version of ValVueFF software. ValVue does this for you.
2. Install ValVueFF 2.32 using the instructions in this chapter.
3. Register ValVueFF using the form provided in the software.

Installing ValVueFF

The following procedure details removing a previous version of ValVueFF and installing ValVueFF 2.32. Do not install ValVueFF 2.32 until you have installed NI-FBUS 4.X.

Launching the Application

There are several ways to start a ValVueFF 2.32 installation. Depending upon your media you can use one of the following start options:

1. Select an icon from the CD-ROM.
2. Enter *ValVueFF Installer.exe* in the *Run* dialog box.

   To install ValVUeFF version 2.32 you must relaunch the application after removing a previous version of ValVueFF.

Removing a Previous Version of ValVueFF

When a previously installed version of ValVueFF is detected by the setup software a series of messages appear.

1. Launch the application. The *ValVueFF CD Browser* window appears (Figure 7).

Figure 7 CD Browser Window

2. Click **Install Software** and the *ValVue FF CD Browser* window appears (Figure 8).

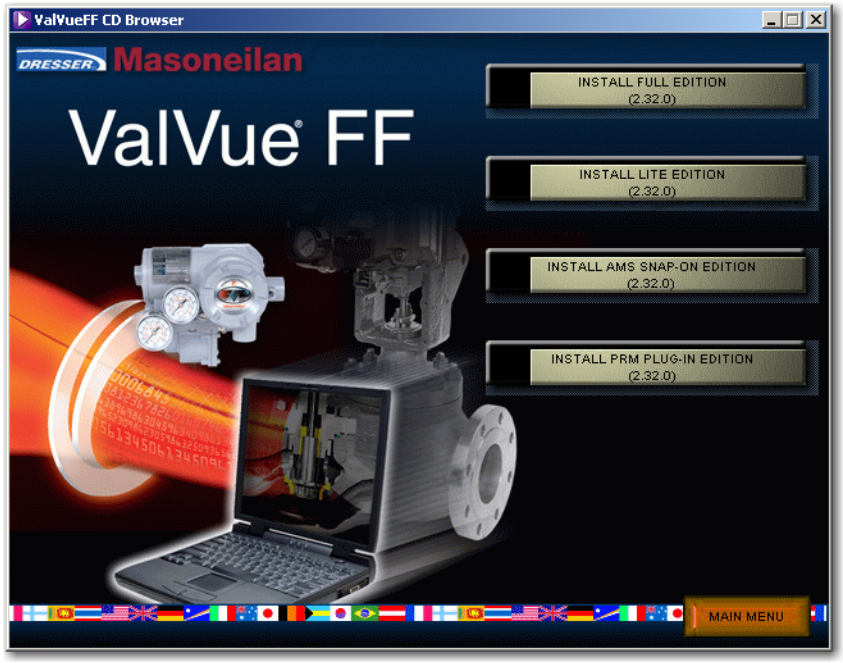

Figure 8 Software Selection Window

3. Click **Install Full Edition** and the *Preparing Setup* dialog box appears followed by a dialog box (Figure 9).

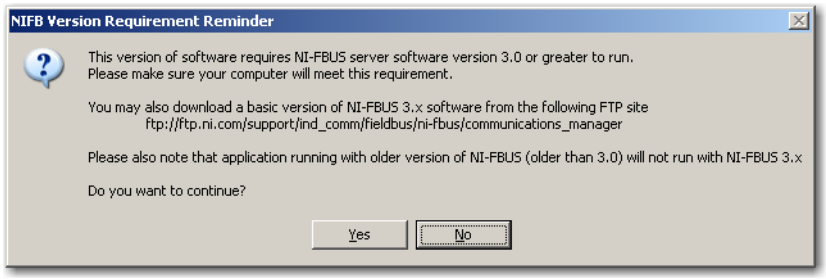
NIFB Version Requirement Reminder
This version of software requires NI-FBUS server software version 3.0 or greater to run.
Please make sure your computer will meet this requirement.
You may also download a basic version of NI-FBUS 3.x software from the following FTP site
ftp://ftp.ni.com/support/ind_comm/fieldbus/ni-fbus/communications_manager
Please also note that application running with older version of NI-FBUS (older than 3.0) will not run with NI-FBUS 3.x
Do you want to continue?
Yes
No

Figure 9 NIFB Version Requirement Reminder

4. Ensure that the fieldbus software is installed, click **Yes** and the *Shut Down* message appears (Figure 10).

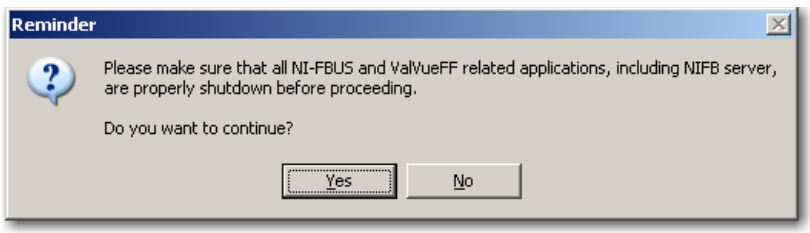
Reminder
Please make sure that all NI-FBUS and ValVueFF related applications, including NIFB server, are properly shutdown before proceeding.
Do you want to continue?
Yes
No

Figure 10 Shut Down Message

5. Select **Yes** to continue. The *Maintenance* dialog box appears (Figure 11).

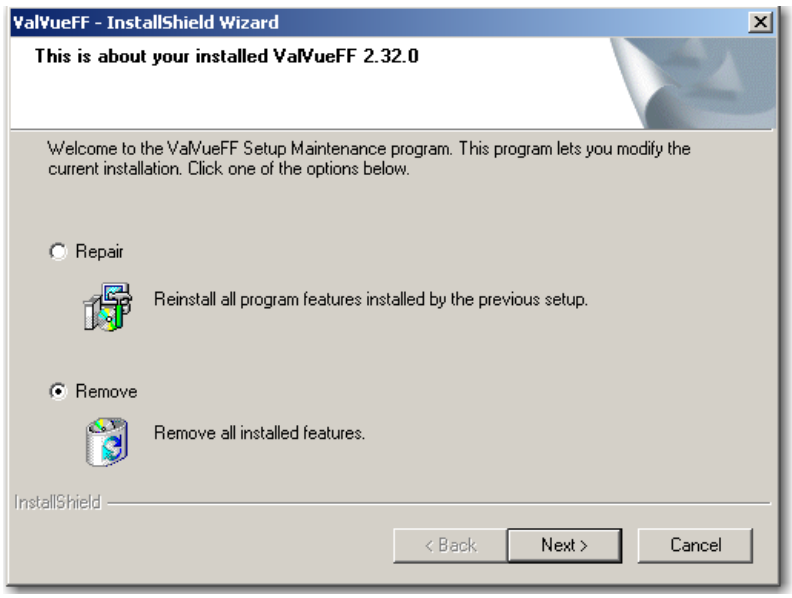
ValVueFF - InstallShield Wizard
This is about your installed ValVueFF 2.32.0
Welcome to the ValVueFF Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.
Repair
Reinstall all program features installed by the previous setup.
Remove
Remove all installed features.
InstallShield
< Back
Next >
Cancel

Figure 11 Select Maintenance Level Dialog Box

6. Select **Remove** and then **Next**. A message box appears asking if you want to remove a previous version of ValVueFF.
7. Select **Yes**. A *Setup Status* dialog box appears, then a *Maintenance Complete* dialog box appears (Figure 12).

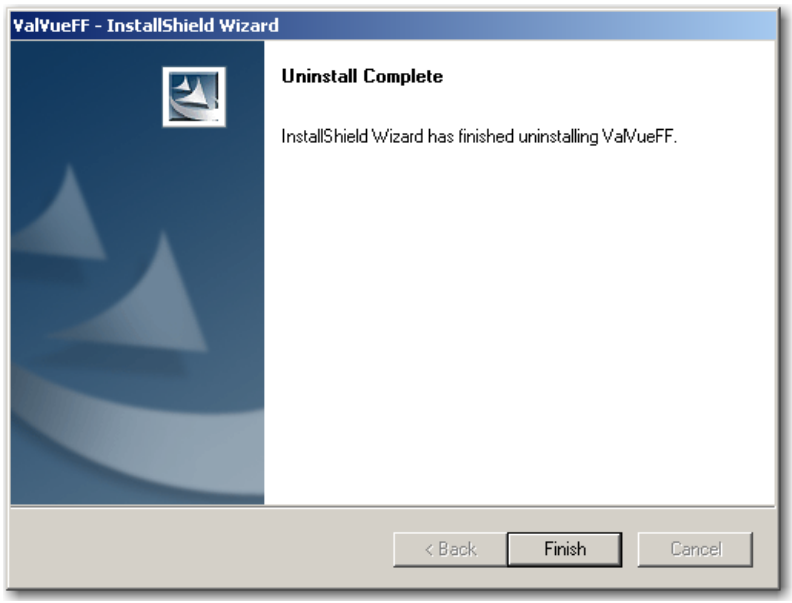

Figure 12 Maintenance Complete Dialog Box

8. Select **Finish**.
9. Relaunch ValVueFF to install the application.

Installing ValVueFF

1. Launch the application. The *ValVueFF CD Browser* window appears (Figure 13).

Figure 13 CD Browser Window

2. Click **Install Software** and the *ValVue FF CD Browser* window appears (Figure 13).

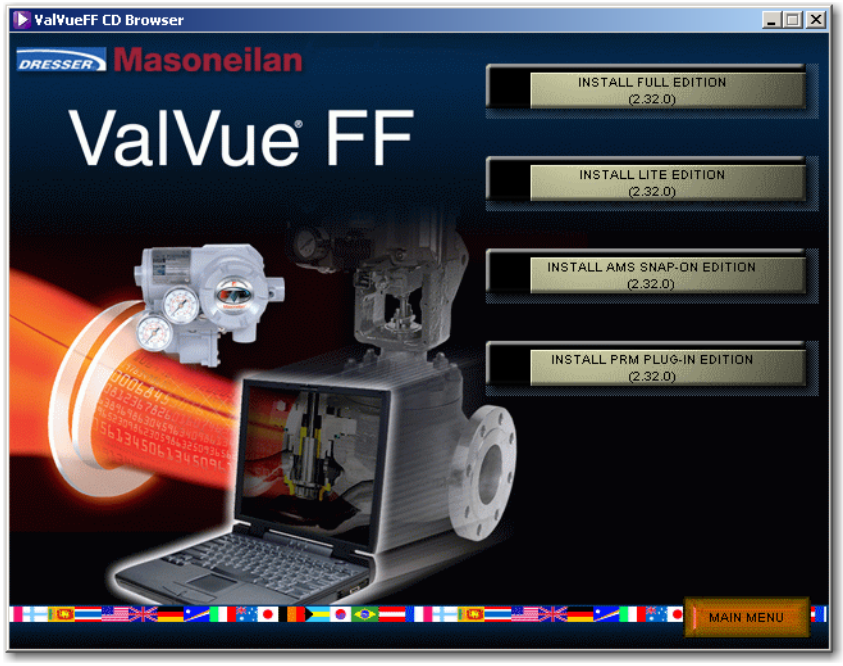

Figure 14 Software Selection Window

3. Click **Install Full Edition** and the *Preparing Setup* dialog box appears followed by a dialog box (Figure 15).

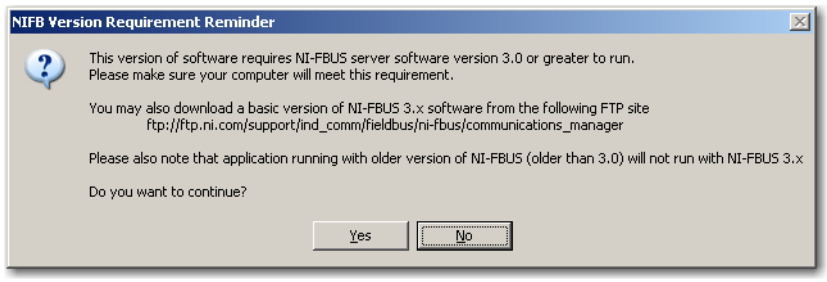
NIFB Version Requirement Reminder
This version of software requires NI-FBUS server software version 3.0 or greater to run.
Please make sure your computer will meet this requirement.
You may also download a basic version of NI-FBUS 3.x software from the following FTP site
ftp://ftp.ni.com/support/ind_comm/fieldbus/ni-fbus/communications_manager
Please also note that application running with older version of NI-FBUS (older than 3.0) will not run with NI-FBUS 3.x
Do you want to continue?
Yes
No

Figure 15 NIFB Version Requirement Reminder

4. Ensure that the fieldbus software is installed, click **Yes** and the *Shut Down* message appears (Figure 16).

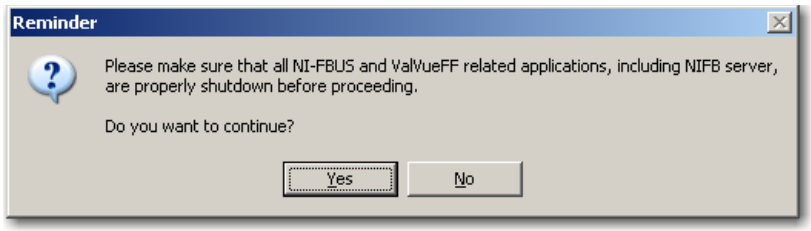
Reminder
Please make sure that all NI-FBUS and ValVueFF related applications, including NIFB server, are properly shutdown before proceeding.
Do you want to continue?
Yes
No

Figure 16 Shut Down Message

5. Select **Yes** and the *Welcome to ValVueFF* dialog box appears (Figure 17).

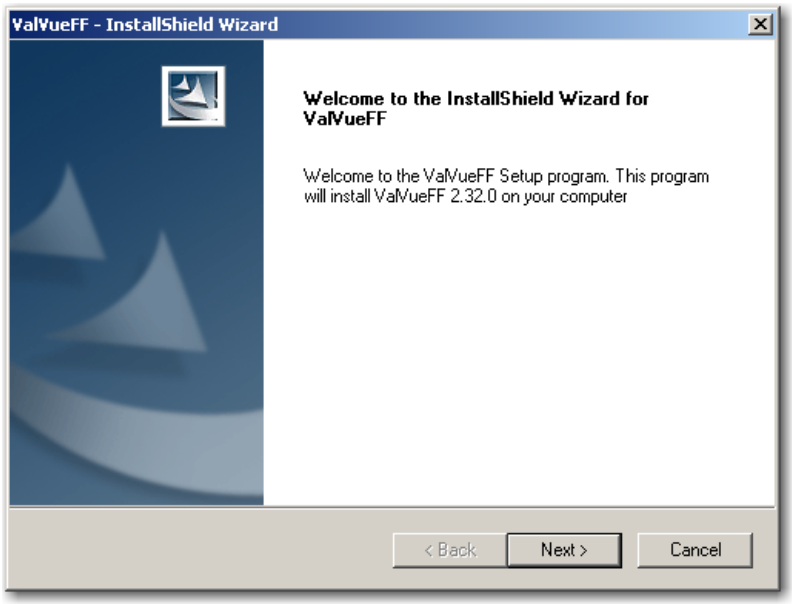
ValVueFF - InstallShield Wizard
Welcome to the InstallShield Wizard for ValVueFF
Welcome to the ValVueFF Setup program. This program will install ValVueFF 2.32.0 on your computer
< Back
Next >
Cancel

Figure 17 Welcome to ValVueFF

6. Select **Next**. The *License Agreement* dialog box appears (Figure 18).

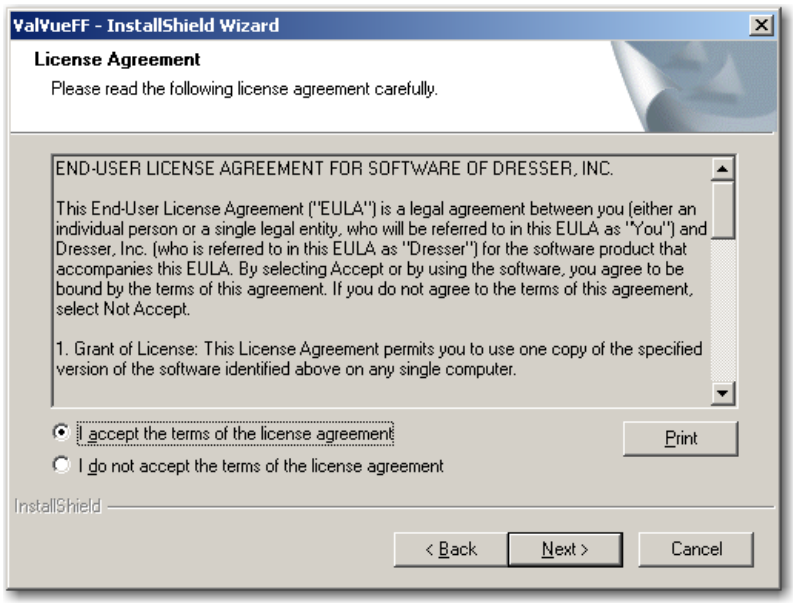
ValVueFF - InstallShield Wizard
License Agreement
Please read the following license agreement carefully.
END-USER LICENSE AGREEMENT FOR SOFTWARE OF DRESSER, INC.
This End-User License Agreement ("EULA") is a legal agreement between you (either an individual person or a single legal entity, who will be referred to in this EULA as "You") and Dresser, Inc. (who is referred to in this EULA as "Dresser") for the software product that accompanies this EULA. By selecting Accept or by using the software, you agree to be bound by the terms of this agreement. If you do not agree to the terms of this agreement, select Not Accept.
1. Grant of License: This License Agreement permits you to use one copy of the specified version of the software identified above on any single computer.
I accept the terms of the license agreement
I do not accept the terms of the license agreement
Print
InstallShield
< Back
Next >
Cancel

Figure 18 License Agreement

7. Select **I Accept**.
8. Select **Next**. The *Choose Destination Location* dialog box appears (Figure 19).

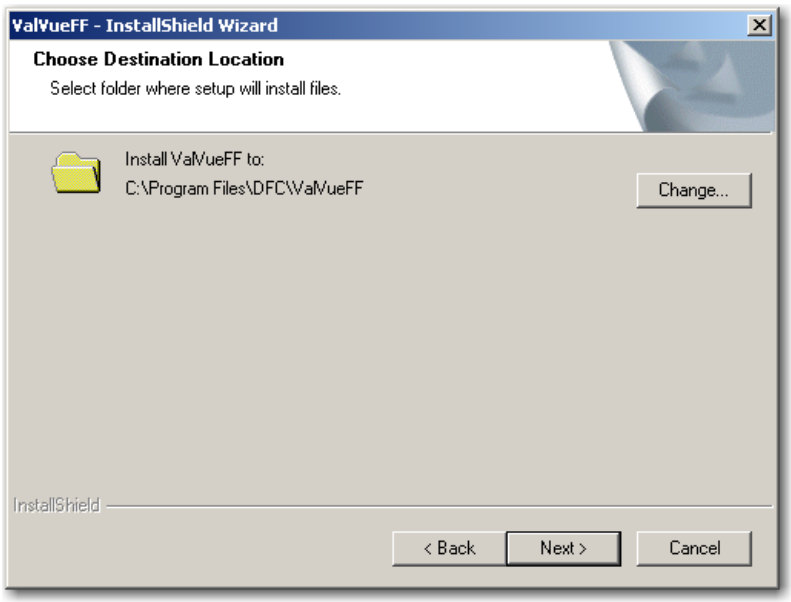

Figure 19 Choose Destination Dialog Box

9. Select:

   ❑ **Next** to accept the default destination.

   OR

❑ **Change** to select an installation location and a browse dialog box appears. Select a location and select **OK**.

Ready to Install dialog box appears (Figure 20).

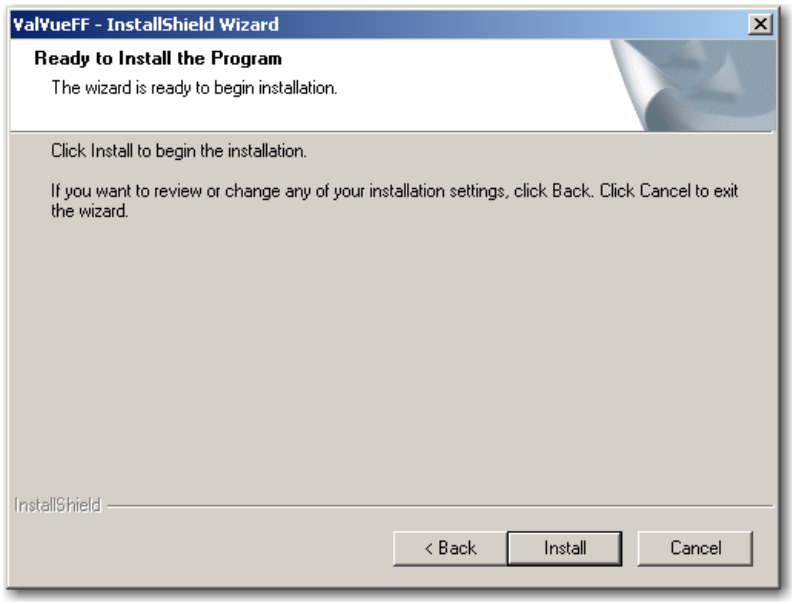
ValVueFF - InstallShield Wizard
Ready to Install the Program
The wizard is ready to begin installation.
Click Install to begin the installation.
If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.
InstallShield
< Back
Install
Cancel

Figure 20 Ready to Install Dialog Box

10. Select **Install**. A *Setup Status* dialog box appears (Figure 21), then *Setup complete* (Figure 22).

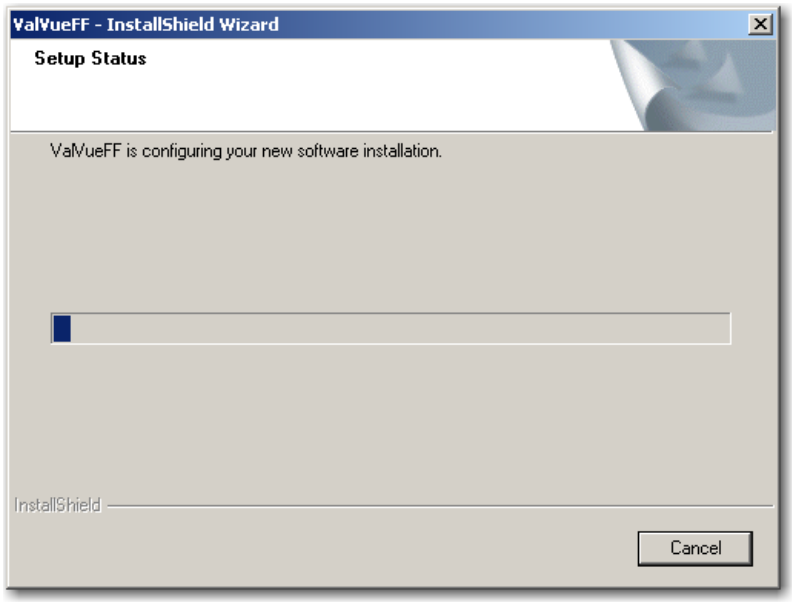

Figure 21 Setup Status Dialog Box

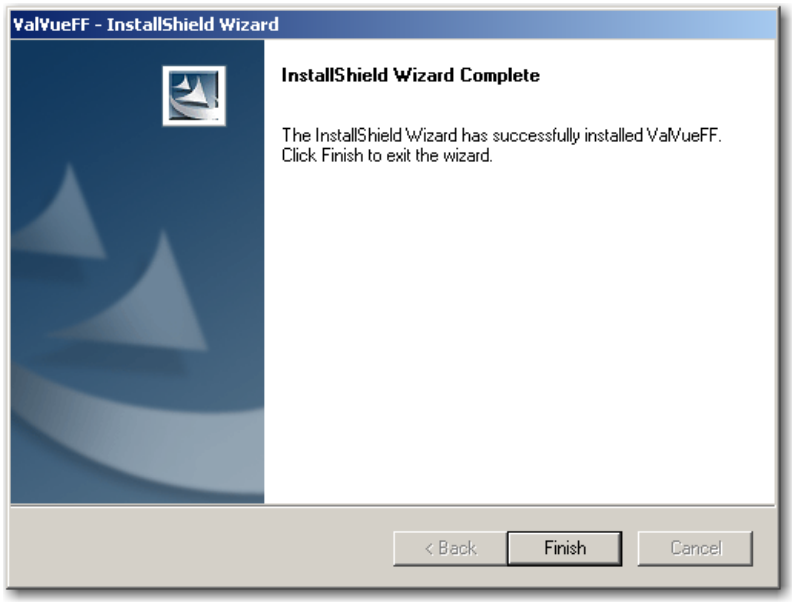

Figure 22 Installation Complete

11. Select **Finish** and a dialog appears (Figure 23).

ValVueFF - InstallShield Wizard
NOTE:
Use National Instrument tool "Interface Config" software
or equivalent to configure the NI-FBUS interface card and
to import DD files file from "DD Files" subfolder of the installation folder
OK

Figure 23 Use National Instrument Tool Dialog

12. Click **OK** and *ValVueFF CD Browser* window reappears.

Trial Period

To use this software for a 60 days free evaluation:

1. Open *ValVueFF* and the *Registration* dialog appears (Figure 26).

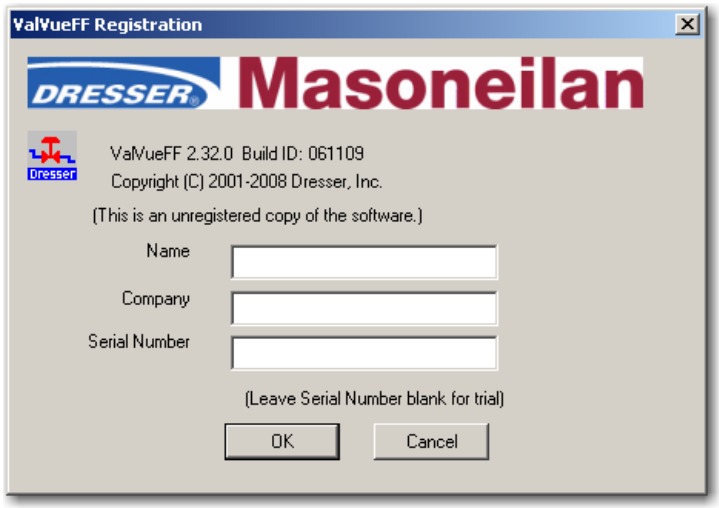

Figure 24 Registration Dialog

2. Leave the *Serial Number* box blank and select **OK** in the *Evaluation Day* dialog box. The evaluation or trial period for the software is 60 days from the first day of use.
3. Select **OK** and logon in the *ValVueFF Logon* dialog box (Figure 25). See “Setting User Accounts, System Administration, Passwords, and Privilege Levels” on page 31 for setting up individual ValVueFF accounts and privileges.

Figure 25 Trial Logon Dialog

4. Click **OK**. A notice appears and tracks the time left for your free trial. You must register within sixty days.

Registration

Permanent use of this software requires a license for each computer it is used on. You must register the software to obtain the software key for your license. If you are using a trial version and wish to purchase a license contact your Masoneilan representative to obtain a serial number.

Previous Versions

If you are upgrading from a previous version of ValVueFF you are NOT required to register the software. Your old registration number populates the registration field for version 2.32 during the installation process. There is no need to take further action.

Registering ValVueFF Software

Use this procedure to register *ValVueFF* software.

1. Open *ValVueFF,* select **Help > Registration Info** and the *Registration* dialog appears (Figure 26).

Figure 26 Registration Dialog

2. Enter your *Name*, *Company* and *Serial Number*, click **OK** and the *Logon* dialog appears (Figure 27). The serial number can be found on your purchase order or on the ValVueFF box.

Figure 27 Logon Dialog

3. Select **OK** and the *Software Key* dialog box appears (Figure 28).

ValVueFF Registration
DRESSER
Masoneilan®
Software Key
Optional Features (Click the Unlock Key area to enter unlock key)
Optional Features
Unlock Keys
HSE SUPPORT
(Leave Software Key blank for trial. To obtain Software Key / Unlock Keys, check feature(s) to be registered and then click Registration)
OK
Cancel
Registration

Figure 28 Software Key Dialog Box

4. Select **HSE Support** if you are using an HSE linking device. Leave this selection blank if you are not using an HSE linking device.
5. Select **Registration**. The ValVueFF registration form appears (Figure 29).

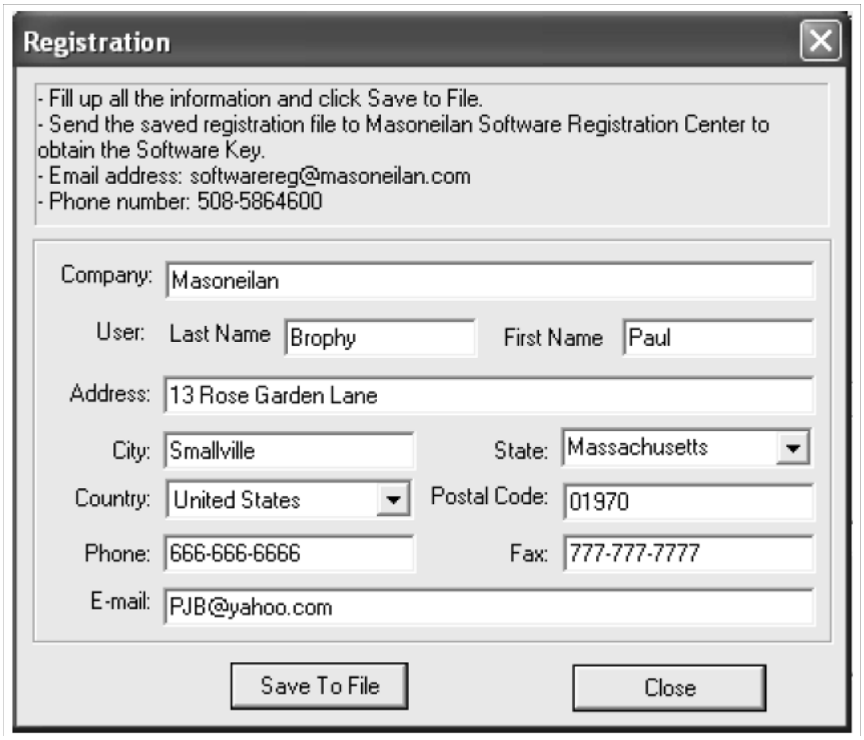
Registration
- Fill up all the information and click Save to File.
- Send the saved registration file to Masoneilan Software Registration Center to obtain the Software Key.
- Email address: softwarereg@masoneilan.com
- Phone number: 508-5864600
Company: Masoneilan
User: Last Name Brophy First Name Paul
Address: 13 Rose Garden Lane
City: Smallville State: Massachusetts
Country: United States Postal Code: 01970
Phone: 666-666-6666 Fax: 777-777-7777
E-mail: PJB@yahoo.com
Save To File
Close

Figure 29 Registration Form

6. Complete the registration file.
7. Select **Save to File**.

8. Attach the *Registration File to* an email and send the email to: *softwarereg@ge.com*. Our Customer Service department emails you a key for your application (Figure 30).

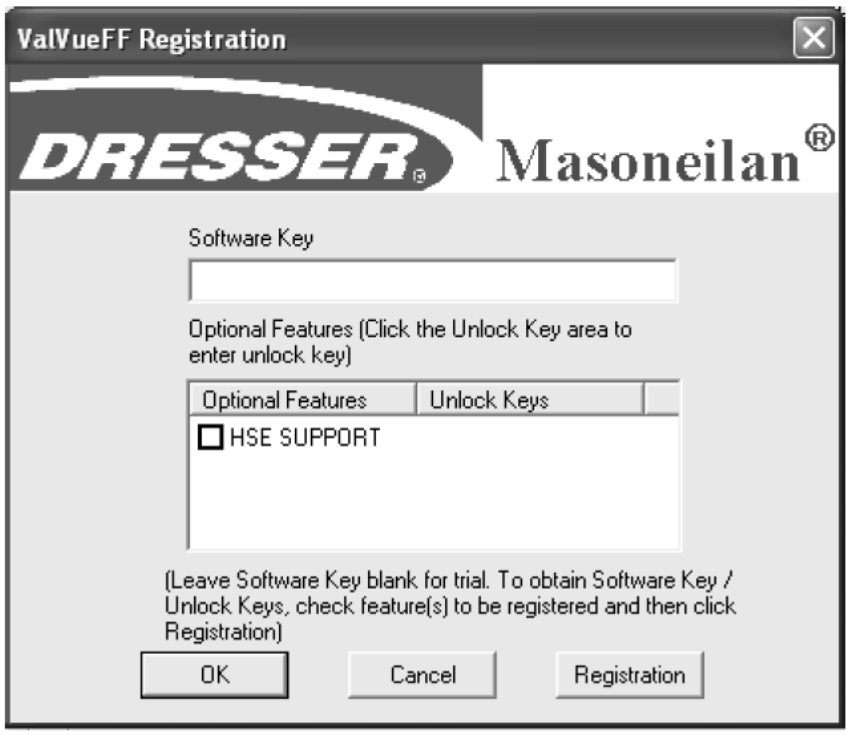
ValVueFF Registration
DRESSER
Masoneilan®
Software Key
Optional Features (Click the Unlock Key area to enter unlock key)
Optional Features
Unlock Keys
HSE SUPPORT
(Leave Software Key blank for trial. To obtain Software Key / Unlock Keys, check feature(s) to be registered and then click Registration)
OK
Cancel
Registration

Figure 30 Software Key Dialog Box

9. Enter your key in the *Software Key* field.
10. Enter the key for *HSE Support* if you requested that key and select **OK**. You are registered.

Setting User Accounts, System Administration, Passwords, and Privilege Levels

In a plant having many users with various levels of training and responsibility it is often necessary to restrict users to a limited range of functions depending on their training and job function. Starting the ValVueFF program requires a valid account with a user name and a password for each user. The privilege level associated with a ValVueFF account determines which functions of the program the user is allowed to access.

The ValVueFF Administration program allows the administrator to perform all user account administrative functions to run ValVueFF and to control access to the functionality of the FVP positioner. Administrative functions include:

- ❑ Adding new user accounts
- ❑ Deleting existing user accounts
- ❑ Changing existing user accounts
- ❑ Adjusting privilege levels Starting Administration Program

To start ValVueFF Administration:

1. Select **Start > Programs > Dresser > ValVueFF Full Edition > ValVueFF Tool > ValVueFF Administration**. The administrative program prompts you for a logon name and password. Login in for the first time with an administrator account (Figure 31).

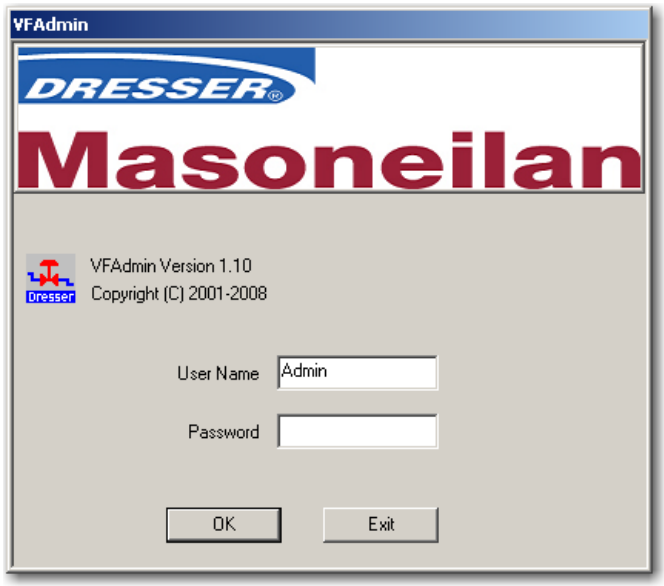

Figure 31 Admin Logon Dialog Box

2. Enter the default logon name *Admin* and leave *Password* blank (case-sensitive).

3. Select **OK** and the *VFAdmin* dialog box appears (Figure 32).

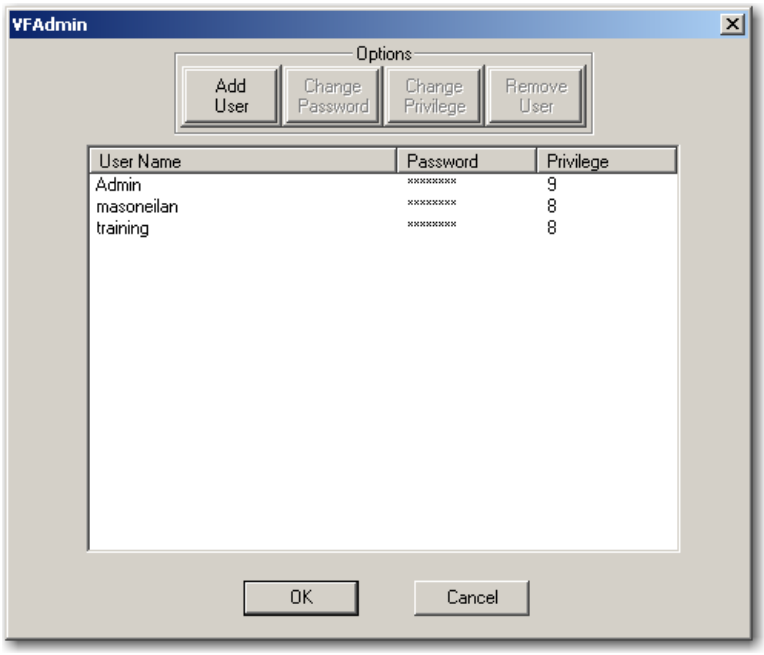

Figure 32 Adding Users in VFAdmin Dialog Box

By default the program contains three accounts:

- *Admin*: The password is case sensitive. The initial password is blank. Use the administration program immediately to install a password for an Administrator and make the system secure from unauthorized use.
- *masoneilan*: lower case, and password of *new*, also lower case.
- *training*: enables use of the FVP process control simulator with the logon name of *training*, lower case, and password of training, lower case. The process control simulator produces a process that has a dead time of one second and a lag of five seconds. The process controller simulator is useful for training users on the many functions and features of the FVP positioner and its PID function block.

User Levels

Each user is assigned an account and each account contains an associated privilege level. You must provide ValVueFF users with an appropriate privilege level to keep field devices secure from the actions of unknowledgeable, unauthorized or malicious users. It is good practice for an Administrator to create a second logon name and password combination, with a lower privilege level, to use for routine tasks.

Privilege levels range from 0 to 9, with level 0 the lowest and 9 the highest. Table 4 defines the privilege levels that control access to specific functions of the ValVueFF program. Services that are not accessible to a particular level are grayed out.

Table 4 User Privilege Level Descriptions

Level	Privilege Level
Level 0	Allows the user to logon to ValVueFF only if the connected FVP is in Auto state. The user can send commands that reply with configuration, calibration, and status information but the user cannot change any information. Level 0 users cannot access Out Of Service or Manual states.
Level 1	Allows the user access to Auto, Manual or Out Of Service states. The user can transfer from one mode or state to another, that is, the user can take the FVP out of Auto and put it in Manual. The user can then set valve position. However, the user cannot change the calibration or configuration. A level 1 user cannot access the PID dialog box.
Level 2	This level is not defined.
Level 3	Allows the user to change the configuration or calibration values but does not allow the user to perform calibration and tuning operations that stroke the valve including Find Stops, Auto Tune, or diagnostics. The user can open the PID dialog box and use it to change PID modes and move the valve in manual or change process variable setpoint. The user can enter tuning parameters for the process variable PID control.
Level 4	Allows the user to perform all operations except Download Configuration to FVP.
Level 5	This level is not defined.
Level 6	This level is not defined.
Level 7	This level is not defined.
Level 8	This level is intended for training, use it cautiously. It grants all of the privileges of level 4 plus allows access to the Simulation State of the process controller. The simulation of the PID Block allows the user to run the process controller without connecting a process variable input to the FVP and is useful for learning how to operate the process controller.
Level 9	Allows access to all FVP functions. In addition, it is the only level allowed to logon to the administration program. The Administrator has an account of privilege level 9. There must be at least one user of privilege level 9 in order to get access to the Administration program.

WARNING

Never use the simulation state if the valve is connected in a control loop or the if the valve is controlling process flow. The simulation state permanently removes important control loop configuration information from the FVP valve positioner. The soft-wired connection between the PID functions block and its input function block must be restored after simulation is used. Reconfigure function block links after using simulate. The Clear Device command must be used when downloading restored configuration.

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Using ValVueFF

5

Overview

Integrated Valve Interface (IVI)

The primary screen for displaying information in ValVueFF, the Integrated Valve Interface screen (IVI) (Figure 33), appears after a successful ValVueFF logon. The IVI displays and updates real time values for valve position, valve Set Point, actuator pressure, and provides access to all other services.

The IVI offers tools and wizards using standard conventions and offers multiple paths to functions to suit a user's preferences. The information and controls for services are arranged in frames within IVI. You have single click access to the PID Controller interface from the IVI. The IVI displays and updates real time values for valve position, valve Set Point and actuator pressure numerically and graphically. The IVI displays all valve and positioner variables and provides access to services such as Setup Wizard, Configuration, Calibration and Diagnostics tools.

Major screen components include (Figure 33):

1. Menu bar: provide access to services that work with files, devices and function blocks.
2. Icon toolbar; provide access to services that work with files, devices and function blocks.
3. Status bar: displays the status of the fieldbus segment.
4. Device List tree frame: used to navigate to a device.
5. *Block Actual Mode* frame; list the mode for all configured blocks.
6. *Other Para bar* frame: shows the schedule Analog Output Block (AO) and PID status and errors
7. Temperature, Pressure and I/P frame: lists the operational data in bar format Internal temperature, output pressure (optional) and servo output to I/P are displayed as bar-graphs.
8. *Position* frame: slider bars to toggle the The *Set Point* and *Target Point* slider bars and the Temperature, Pressure and I/P indicators on/off using the View menu. Also shows the *Actual Position*.

9 *Selected Device* frame: device tag and operational state

10 *Companion Device* frame: shows summary information from a second positioner on the same segment as the selected device.

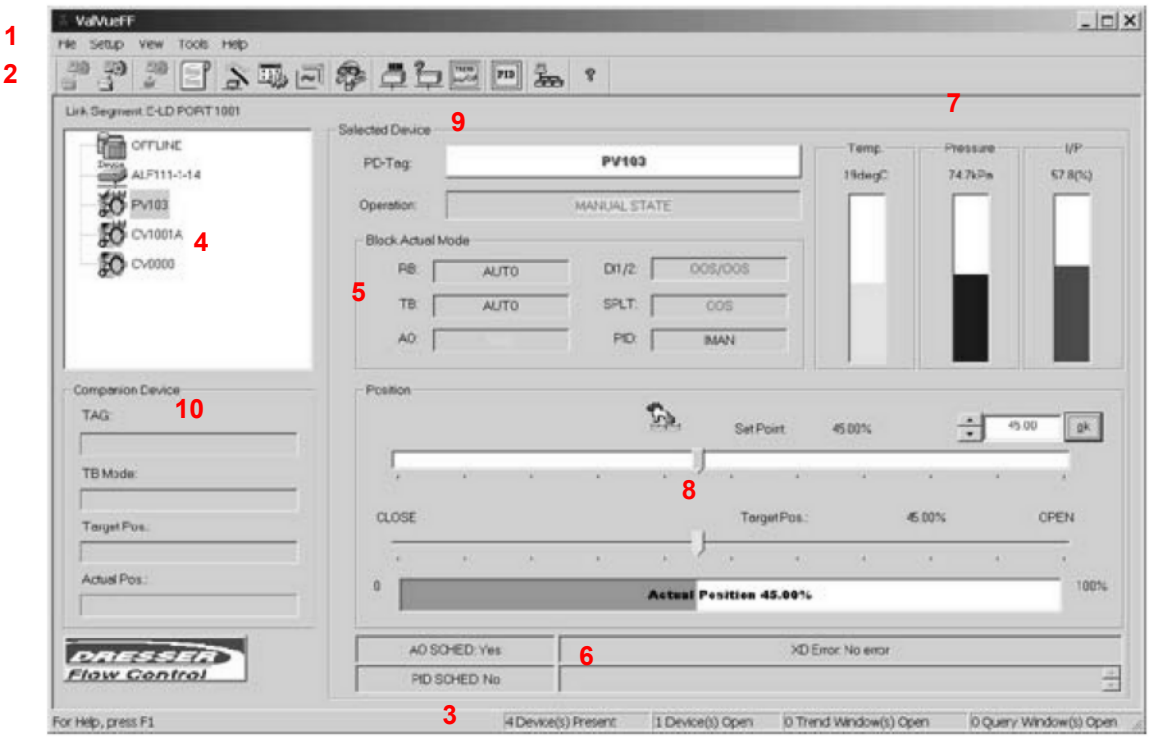

Figure 33 ValVueFF Integrated Valve Interface (IVI)

Menu Bar

Table 5 explains the menu bar functions. The drop down menus and icon tool bar provide access to services that work with files, devices and function blocks.

Table 5 ValVueFF Menu Selections

Menu	Menu Item	Display
File	*Open File*	*Device Configuration File* dialog box used to display saved configurations.
	Save File	Allows you to store a configuration in a folder for later use.
	Generate Report	A browser containing a template preloaded with configuration details.
	Exit	Closes the application and prompts you to save all unsaved information.

Table 5 ValVueFF Menu Selections (Continued)

Menu	Menu Item	Display
Setup	*Setup Wizard*	*Setup Wizard* dialog box is used to do an initial setup on a positioner.
	Configuration	Displays the *Configuration* dialog box used to reconfigure a positioner.
	Calibration	Displays the *Calibration* dialog box used to recalibrate a positioner.
	Device Tag/Address	A dialog box used to change the tag name or address of a device.
View	*Toolbar*	Toolbar at the top of the screen containing important ValVueFF functions.
	Status Bar	Information at the bottom of the screen detailing devices, trends, and queries.
	View Trend	*Trend* dialog box displaying a graphical view of the current selected device. See “PID Block and Trending Services” on page 119.
	PID Controller	*PID Controller* dialog box used to view and control the PID Process Controller. See “PID Block and Trending Services” on page 119.
	Fail Safe Status	*Fail Safe Device* dialog box that details devices in Failsafe mode. See “Failsafe Handling” on page 173.
	Device Op State	Change the operation state of a selected device. See “Device Tag/Address” on page 57.
	Companion Device	Permits selection and enabling of a er device. See “Companion Device Display Frame” on page 44.
	Servo Output to I/P	Toggles the I/P slider bar display, the third of the three slider displays.
	Pressure	Toggles the *Pressure* slider bar display, the second of the three slider displays.
	Temperature	Toggles the *Temperature* slider bar display, the first of the three slider displays.
	Other Para Bar	Toggles the blank double window at the bottom of the screen.
	Clear Comm Error	Clears the list of *FF Command* errors that have been collected.

Table 5 ValVueFF Menu Selections (Continued)

Menu	Menu Item	Display
Tools	*Diagnostics*	Diagnostics dialog box used to diagnose a selected device.
	Query Device	Query dialog box used to display a selected device.
	Re-Scan Devices	Scan dialog box used to rescan the link for a list of all devices.
	Download	Downloads the current configuration into a selected device.
	Download Firmware	Downloads new firmware into a selected device.
	Set as Link Master	Dialog box used to set a device as a link master.
	Reboot Device	Dialog box used to restart a connected device. Reboot device is available only to Administrators. For current selected device, if it is running as LAS, a message refusing the reboot operation appears.
	Close Device	Dialog box used to shut down a connected device.
Help	*Help Topics*	The ValVueFF Help system.
	About ValVueFF	Returns a message box with ValVueFF version number and copyright notice
	Registration Information	Registration information used to register this software application.

Icon Toolbar

Each menu selection that displays a dialog box has a corresponding Toolbar Icon (Table 6). A greyed out icon means the functionality does not apply to the currents application or that you don't have the requisite permission level.

Tool Tips Feature

When you place the cursor on an icon a Tool Tip message displays the function of the selected icon. Similarly, if you place the cursor on a menu selection without clicking, a *Status Bar* message appears describing the function or action about to be selected. These features are displayed in Figure 34 and Figure 35.

Figure 34 Tool Tips Message

Figure 35 Status Bar Message

Table 6 Toolbar Icons

Icon	Definition
	Open Configuration File - Displays the *Open Configuration Device* dialog box that can access previously used configurations.
	Save Configuration File - Displays the Save Configuration Device dialog box used to archive previously used configurations.
	Download Configuration - Opens a dialog box used to download an existing configuration from your PC.
	Generate a Report File - Opens a dialog box used to generate a summary report of all configuration parameters.

Table 6 Toolbar Icons (Continued)

Icon	Definition
	Setup Wizard - Opens a dialog box used to set up a valve positioner. This feature is useful if you are setting up a valve for the first time.
	Configuration Management - Opens a dialog box containing six tabs that is used to for device configuration. The tabs are General, Position, Actuator, AO Block, PID Block and Options.
	Calibration Management - Opens a dialog box used to adjust a positioner to the actual stroke of a valve. Tabs include *Range, Tuning, Travel Calibration*, and *Advanced*.
	Diagnostics - Opens a dialog box used to perform actuator and positioner signature test procedures. Real time diagnostic test data is also displayed here.
	Change Device Operation State - Opens a dialog box used to switch between operating states. The operating states are Normal, Manual, and Out of Service.
	Query Device - Opens a dialog box used to access device data in predefined categories. The two tabs area *General* and *Block Parameters*.
	Trend - Returns a dialog box used to display real-time data from polled devices.
	PID Process Controller - Returns a dialog box used to manage the PID function block.
	Rescan the Field Bus Segment - Returns a dialog box used to refresh connections to all working devices in the fieldbus segment.
	About ValVue FF Version - Returns a dialog box that displays a version number for ValVueFF and a copyright notice.

Positioner Faceplate

The positioner faceplate frame contains controls used for working with a positioner. Some of the faceplate features can be toggled on and off. When a feature is active a check mark displays next to the features description on the *View* menu.

Figure 36 shows an inactive positioner faceplate with features turned off. Figure 37 shows an inactive positioner faceplate with all feature turned on. Features are toggled using selections on the *View* menu.

Features that can be toggled on and off include:

- ❑ Toolbar
- ❑ Servo Output to I/P
- ❑ Temperature
- ❑ Status Bar
- ❑ Pressure
- ❑ Other Parameter Bars

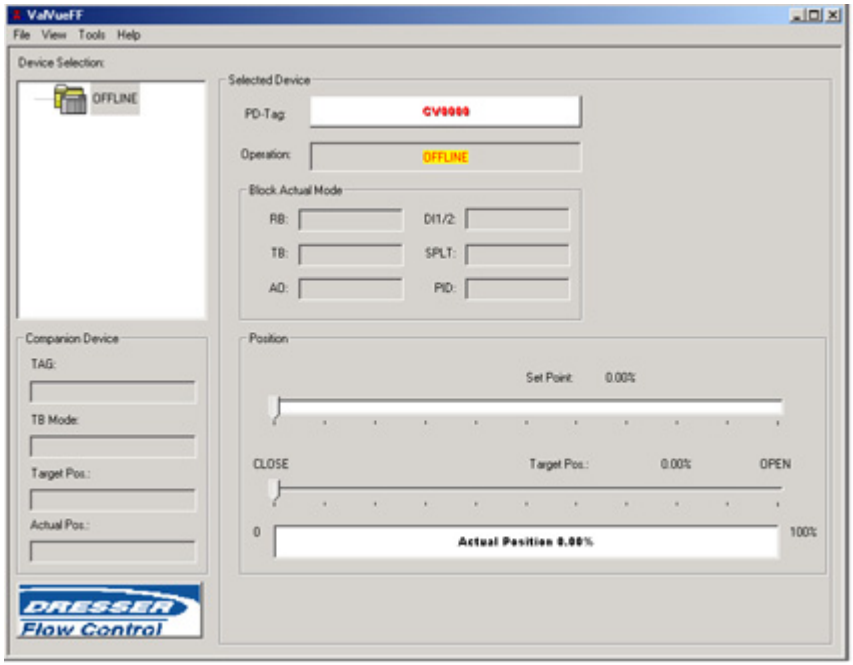

Figure 36 IVI Positioner Faceplate Frame - Functions Turned Off

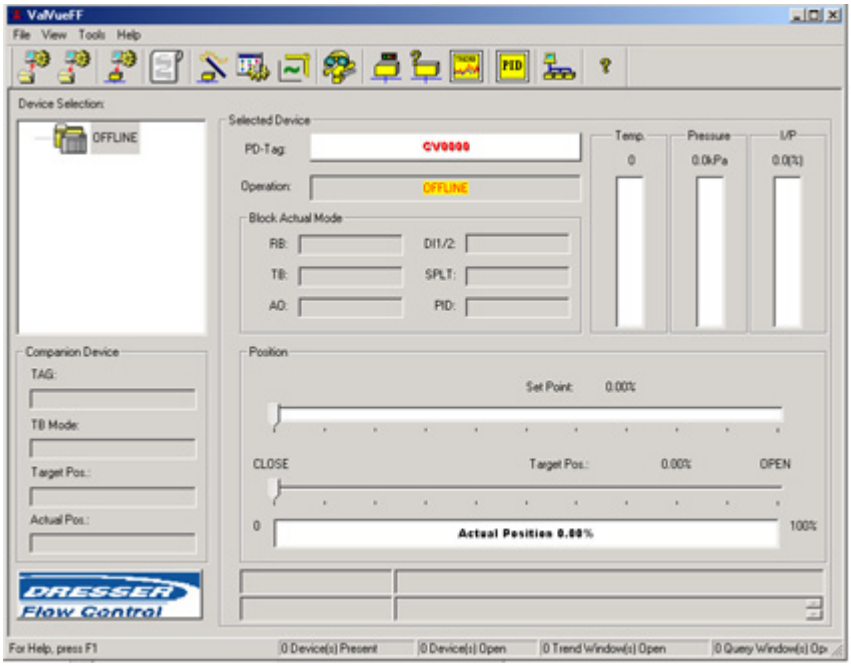

Figure 37 IVI Positioner Faceplate Frame - Functions On

Active Faceplate

Figure 38 shows an active Positioner Faceplate frame with complete functionality:

- ❑ The control valve tag is shown in the *PD-Tag* field.
- ❑ The current operating state of the positioner is shown in the *Operation* field. In this example the display reads, *NORMAL STATE*.
- ❑ *Block Mode Actual* displays individual block modes appear for each of the positioners internal function blocks.
- ❑ The valve position *Set Point* appears next to the graphical position of a slider control, numerically to two decimal places.
- ❑ Below the *Set Point* display, the target position and actual position are shown as a slider and bar, respectively, with values shown to two decimal places.

The *Target Position* is obtained from the *Set Point* signal using parameters defined using *Configure* (see page 79), from valve characterization and the configuration of air-to-open or air-to-close, also defined in *Configure*. It is further modified by any configured limits. In Figure 38 the incoming setpoint and the target position differ as an equal percent characteristic is used. If a linear characteristic and air-to-open are configured, with limits configured outside the possible range of position, the *Target Position* is equal to the *Set Point*.

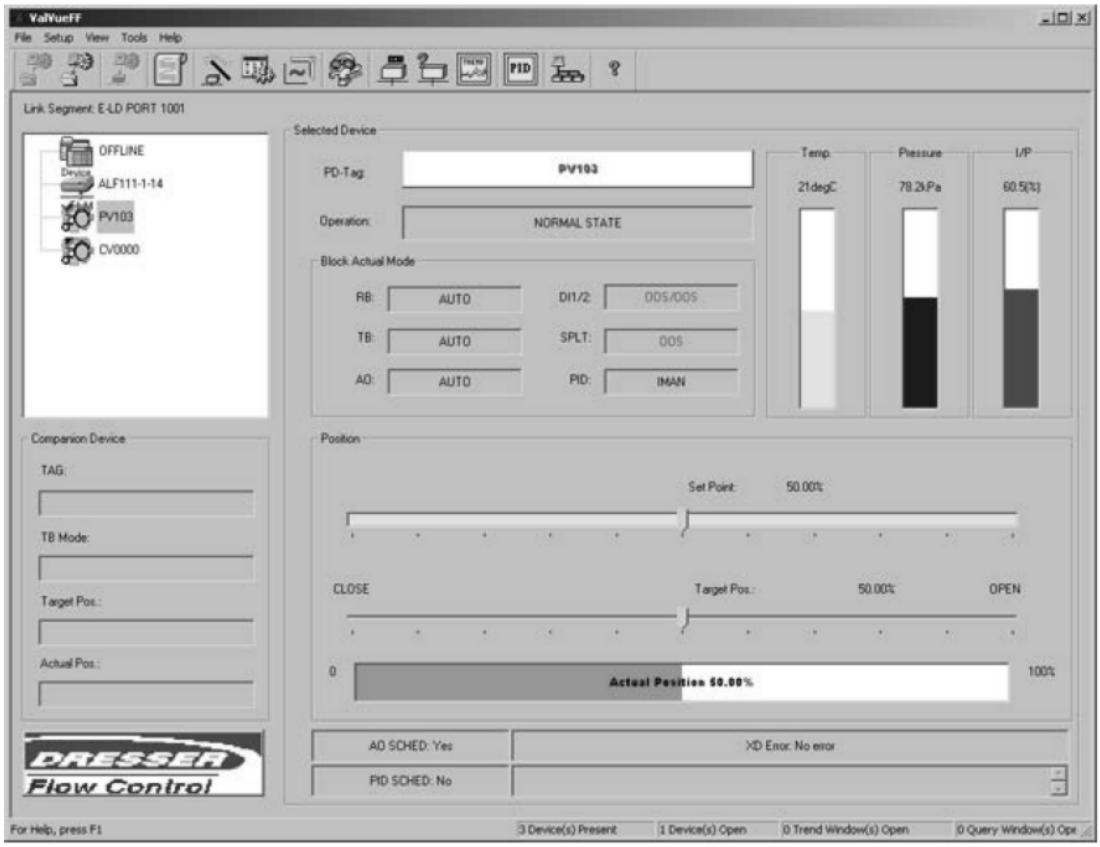

Figure 38 IVI Faceeplate in Normal State

Companion Device Display Frame

The *Companion Device* frame (Figure 39) displays and updates real time values for transducer block mode, target position, and valve position. Use it to observe summary information from a second positioner connected in the same segment as the selected device.

To select a companion device:

1. Choose a focus device selected and viewed in the *Selected Device* frame.
2. Select **View > Companion Device > Select** or right-click a non-selected device to access the *Select/Deselect as Companion* dialog box. The companion device must be an FVP valve positioner connected to the same segment as the selected device.

Fields

Tag	The physical device tag of the selected companion device.
TRANSDUCER BLOCK (TB) Mode	The actual mode of Transducer Block (TB) of the selected companion device.
Target Position	The target valve position of the selected companion device.
Actual Position	The actual valve position of the selected companion device.

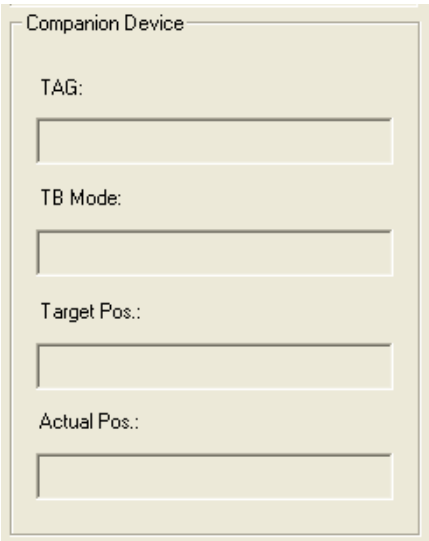

Figure 39 Companion Device

Status Frame

The *Status Frame* (Figure 40) displays *Analog Output Block (AO)* and *PID* block scheduling status. In addition, the transducer block error (*XD ERROR*) appears. The communication error text box accumulates error messages that can be copied to a text file for analysis. To clear the error text box select **View > Clear Comm Error Display**.

Figure 40 Status Frame

Selected Device Frame

The *Selected Device* frame (Figure 41) provides a dedicated view for a specified device. The view includes device tag and operation state, block actual mode, valve position and Set Point, and other status and parameters bar graph. It encloses displays and controls for working with the positioner and control valve. The individual components are explained elsewhere.

Each of the parameters displayed in the control faceplate dialog has a function block and parameter name (shown in the form of BLOCK.PARAMETER). These are listed in Table 7.

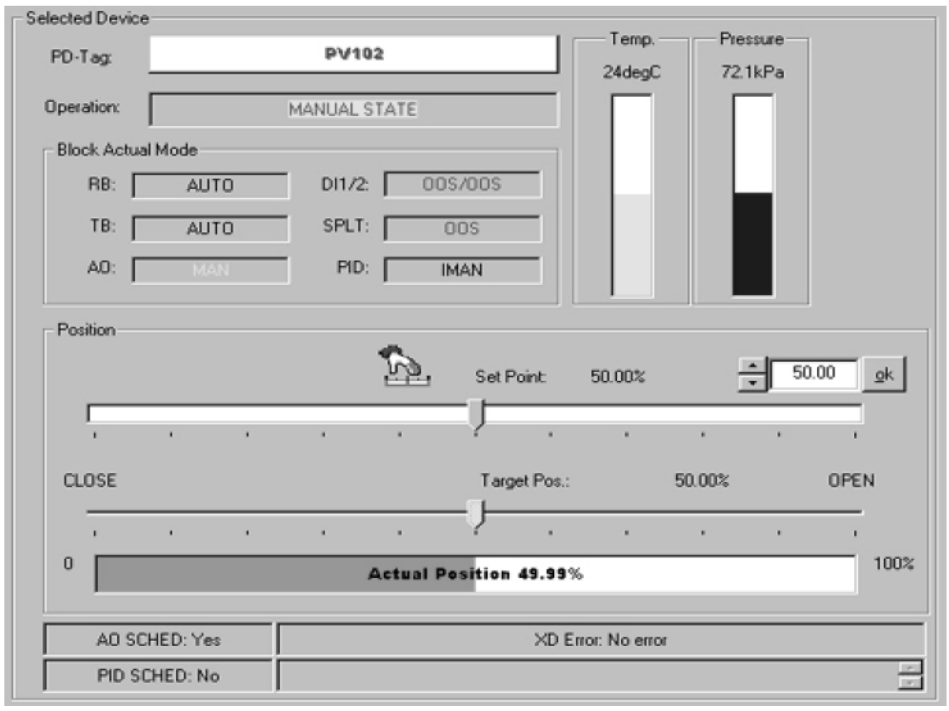

Figure 41 Positioner Faceplate with =% Characteristic

Table 7 IVI Faceplate Parameters

Display	Display Type	Parameter Name	Remarks
PD - Tag		[PD.TAG]	This indicates the FVP tag
Operational State	Active Control	Device Operation State can be one of the following: ❑ NORMAL ❑ MANUAL ❑ Out of Service If no physical device is selected OFFLINE is displayed as the operation state.	
Setpoint Signal		[AO.OUT]	Desired valve position before application of characterization and limits.
Target Position	Slider and XX.XX%	TB.FINAL_POSITION	Desired valve position as derived by the FF input value into the FVP.
Valve Position	Bar and XX.XX%	TB.FINAL_POSITION _VALUE	This indicates valve stem or shaft position in percent of ranged travel.
Temperature	Bar and XX deg	TB.ELECT_TEMP	Device environmental temperature [-40, 85] °C or [-40, 185] °F Color: Yellow
Pressure	Bar and XX.XX PSI	TB.OUT_PRESSURE	FVP output pressure for a S/A positioner or diff. pressure for a D/A positioner. Blue color. Scale=TB.SPRING_RANGE
I/P	Bar and XX.XX%	TB.SERVO_OUTPUT_SIGNAL	80 - 100% = Red 20 - 80% = Green 0 - 20% = Yellow
Block Modes	Color coded individual boxes	Block.MODE_BLK Block = RB, TB, AO, DI, or PID	AUTO, Cas RCas = Green OOS = Red MAN = Yellow

Block Actual Mode

Table 8 lists the supported modes of the valve positioner for each block.

Table 8 Block Modes

Block	Supported Modes
Resource	Auto, O/S
Transducer	Auto, O/S
AO	RCas, Cas, Auto, Man, (LO), (IMAN), O/S
DI	Auto, Man, O/S
OS	Cas, Auto, (Iman), O/S
PID	ROut, RCas, Cas, Auto, Man, (LO), (IMAN), O/S

Device Selection

All of the devices on the bus segment live list are shown as icons in the *Device Selection* box. Select any device to open a communications session with the positioner. The fieldbus segment live list is continuously scanned and devices are shown when present. Devices that have communications failure are shown with a red X. The selected device is shown with a red checkmark in Figure 42.

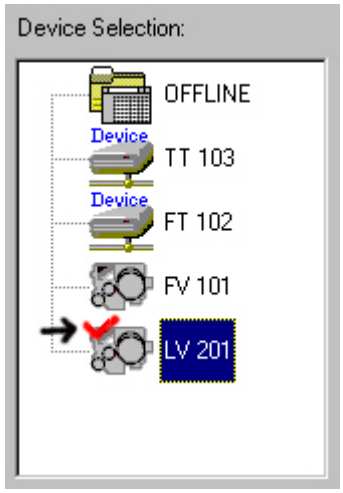

Figure 42 Device Selection Dialog Box

When a device is selected a warning dialog box informs that an attempt is made to connect to a new device. Then the *Read* configuration dialog box displays progress uploading device data.

The *Device Selection* popup menu (Figure 43) offers direct access to services. Right-click on the device to access this menu.

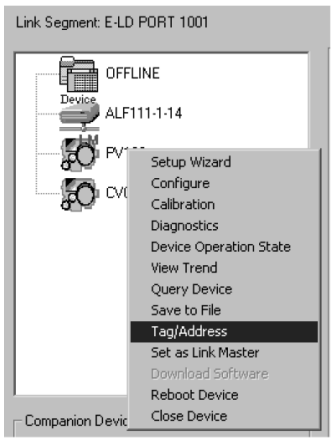

Figure 43 Device Selection Popup for Tag/Address

Using ValVueFF Menu Selections

ValVueFF services are accessed using three standard Windows techniques. The *Device Selection* with popup menu is shown in Figure 44.

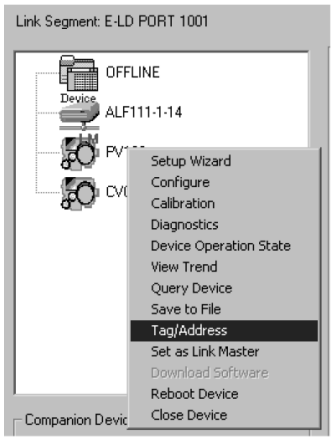

Figure 44 Device Selection with Popup Menu

Tools Menu	Select with a left mouse button click on menu and then select a menu item from the drop down list.
Toolbar Icon	Select with a single left mouse button click on the icon.
Device Selection with Popup Menu	Right-click on the desired device.

Setup Menu

Menus items include:

- ❑ “Setup Wizard” on page 49
- ❑ “Configuration Services” on page 55
- ❑ “Calibration Services” on page 56

Setup Wizard

The *Setup Wizard* provides (Figure 45), in a single tool, all the services for commissioning a valve positioner. It includes a sequence for configuration and tuning. It is most useful for first time setup of the positioner. Follow the step-by-step instructions in five dialog boxes to quickly complete the setup and to start running the valve. The dialog box parameters are detailed in the next two chapters of this manual. The process includes:

- ❑ “Actuator Wizard”
- ❑ “Tuning Wizard” on page 51
- ❑ “Travel Calibration Wizard” on page 52
- ❑ “Position Control Limits - Wizard” on page 53
- ❑ “Finish Setup Wizard” on page 54

Setup Wizard - Welcome (No Device Attached)
Welcome to Setup Wizard for FF based valve positioner !
This simple setup wizard will walk you through a basic configuration and calibration step by step to get the selected valve positioner up and running quickly. It requires the complete installation of the valve positioner on a control valve with actuator and air supply to complete this setup.
On each setup page, enter proper values for displayed parameters and follow the instruction to go through necessary steps.
Press Back button if you need to go back to previous setup page; press Next button if you are ready to proceed to next setup page when Next button is enabled.
Press Finish button at the last setup page when you need finish this setup.
Press Abort button will abort this setup and restore only the displayed parameters value.
< Back
Next >
Abort
Trend
Query Device

Figure 45 Setup Wizard

Actuator Wizard

Use the *Setup Wizard* setup page (Figure 46) to configure the Transducer Block (TB) valve actuator information. For a description of the parameters, refer to “Actuator Page” on page 87.

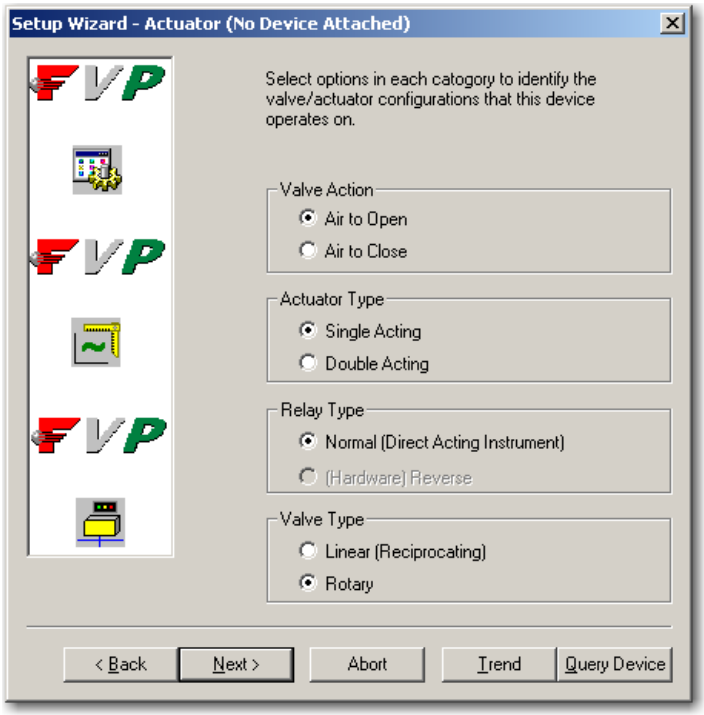

Figure 46 Actuator Wizard

Tuning Wizard

Use the *Tuning* step to execute the combination of *Search Stops* + *Auto Tune* described in “Tuning Tab” on page 109 (Figure 47).

WARNING *Tuning strokes the valve over its entire travel. Isolate the valve from the process prior to calibration*

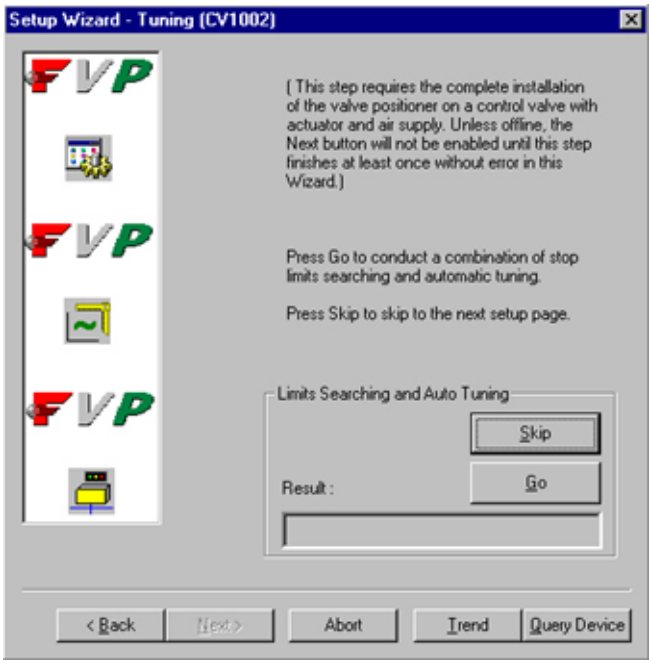
Setup Wizard - Tuning (CV1002)
(This step requires the complete installation of the valve positioner on a control valve with actuator and air supply. Unless offline, the Next button will not be enabled until this step finishes at least once without error in this Wizard.)
Press Go to conduct a combination of stop limits searching and automatic tuning.
Press Skip to skip to the next setup page.
Limits Searching and Auto Tuning
Skip
Result :
Go
< Back
Next >
Abort
Trend
Query Device

Figure 47 Tuning Wizard

Travel Calibration Wizard

Use the *Travel Calibration* page (Figure 48) to calibrate the 0%, 50% or 100% position points, when necessary. For a description of all the parameters and controls, refer to “Travel Calibration Tab” on page 112.

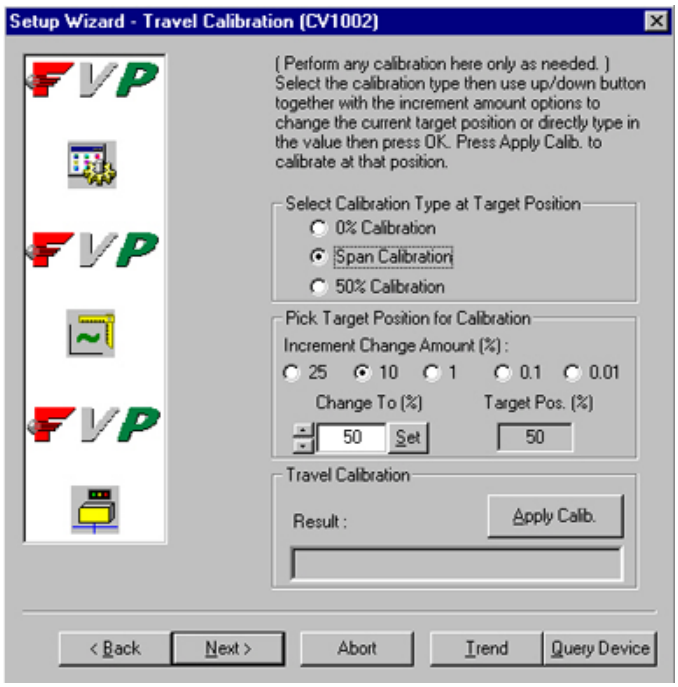

Figure 48 Travel Calibration Wizard

Position Control Limits - Wizard

Use the position control limits page (Figure 49) to change the position limit setting for the valve position configuration parameters in Transducer Block (TB). The parameters are detailed in “Position Limits Parameters” on page 75.

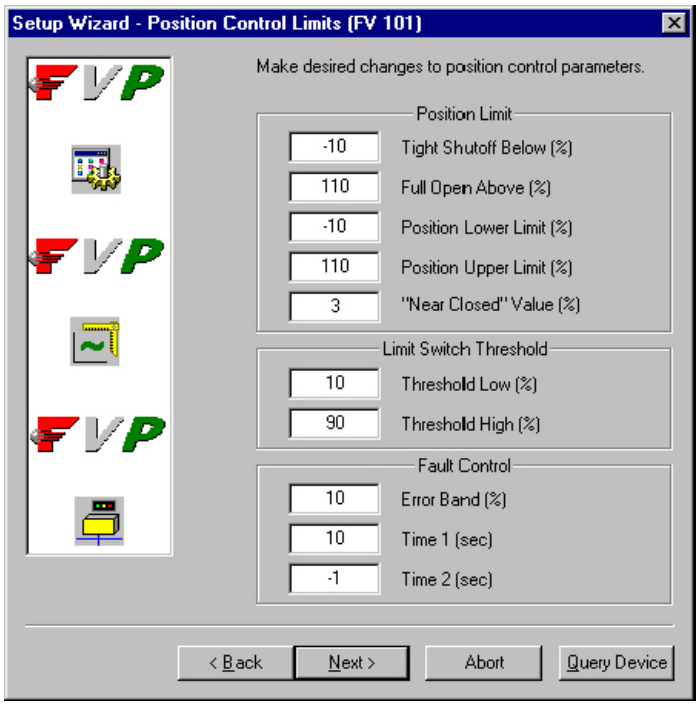

Figure 49 Position Control Limits Wizard

Finish Setup Wizard

This is the final screen (Figure 50) and indicates that the basic setup is valid and provides a choice of *Device Operation States* before completing setup. The setup is not completed until **Finish** is selected.

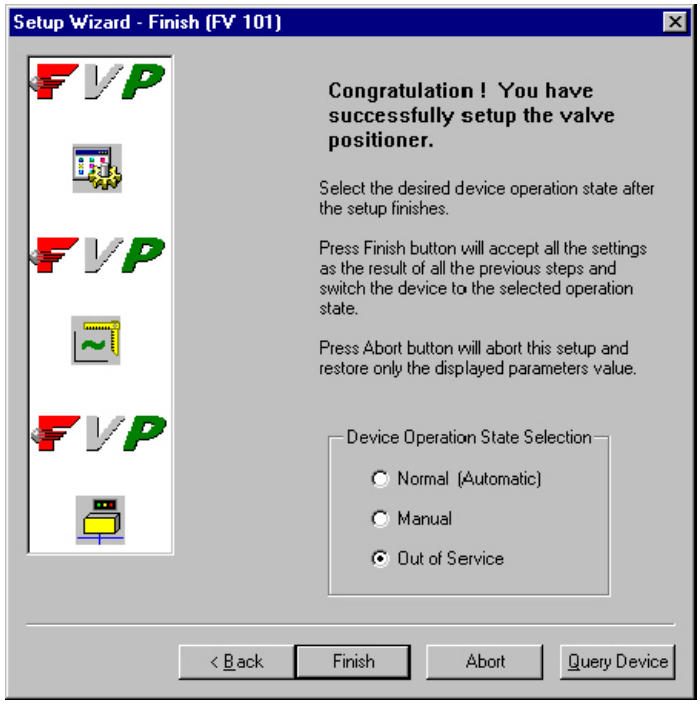
Setup Wizard - Finish (FV 101)
Congratulation ! You have successfully setup the valve positioner.
Select the desired device operation state after the setup finishes.
Press Finish button will accept all the settings as the result of all the previous steps and switch the device to the selected operation state.
Press Abort button will abort this setup and restore only the displayed parameters value.
Device Operation State Selection
Normal (Automatic)
Manual
Out of Service
< Back
Finish
Abort
Query Device

Figure 50 Setup Wizard Finished

Configuration Services

The *General* tab on the *Configure* window (Figure 51) includes the *Device Info*, *Block Tag Info*, and *Others Installed*. The other tabs on this window are:

- *Position* for configuring position limits and switches.
- *Actuator* for configuring valve action and limits.
- *AO Block* for configuring block setpoints and status options.
- *PID Block* for configuring block parameters, setpoint limits and status options.
- *Options* for configuring characterization type and setting units.

See “Configuration Services” on page 79 for detailed information.

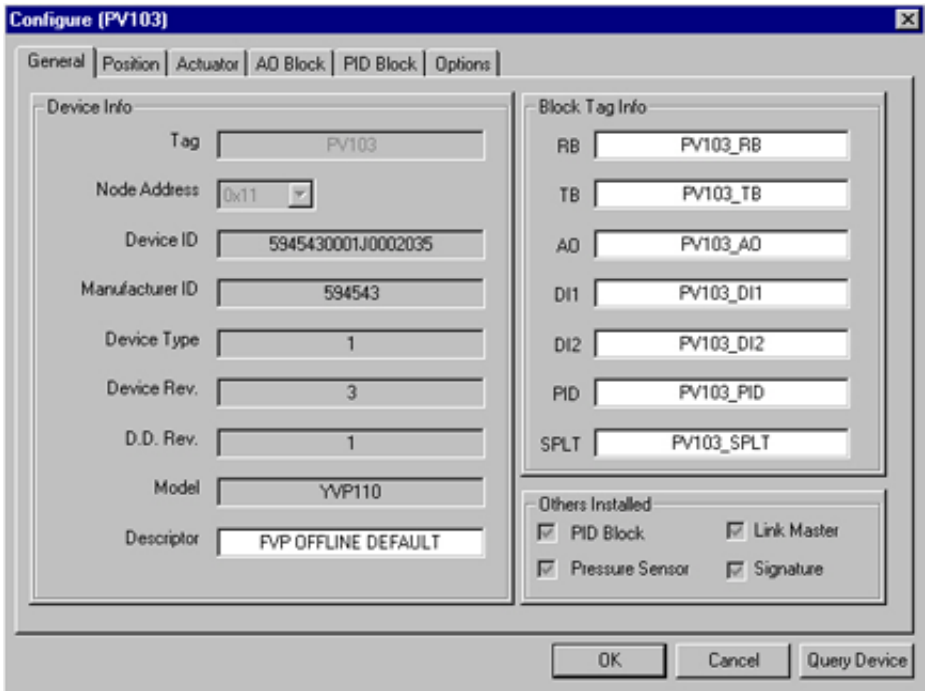

Figure 51 Configuration Dialog Box

Calibration Services

The *Calibration* page (Figure 52) contains the following tabs:

- *Range*: Use to adjust the positioner to the actual stroke (range) of the valve.
- *Tuning*: Use to Auto Tuning the position control algorithm.
- *Travel Calibration:* Use to make additional adjustments to valve stroke.
- *Advanced:* Use to set non-linear factors to optimize dynamic performance.

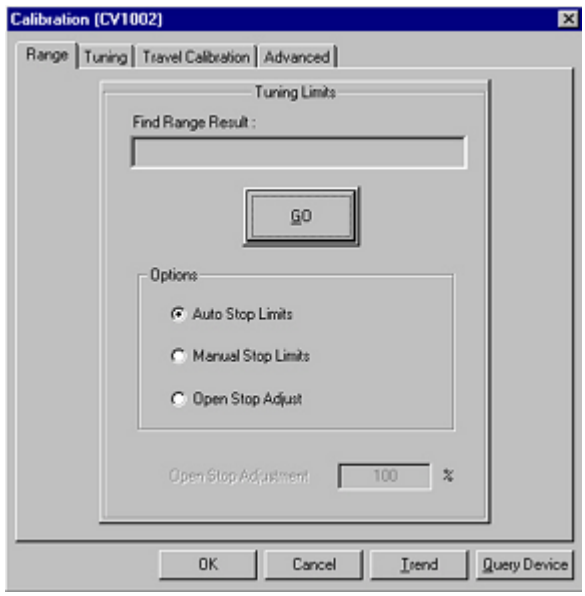

Figure 52 Calibration Dialog Box

See “Calibration Services” on page 105 for detailed information.

Device Tag/Address

To change the node address or PD-Tag of any device listed in *Device Selection:*

CAUTION

Changing the device tag/address clears the linkage and trend configuration in the device and may interrupt the device operation.

1. Either:

   ❑ Right-click the device to bring up the context menu.

   or

   ❑ Select **Setup > Device Tag/Address**.

2. Enter a unique *Device Tag* for the entire control plant.
3. Select a **Node Address** unique in the segment from the dropdown list of allowed addresses. Use only the allowed address to avoid communications errors.

Figure 53 Tag/Address Dialog

View Menu

Menus items include:

- ❑ “View Trend” on page 58
- ❑ “PID Controller” on page 59
- ❑ “Device Operation State” on page 61

View Trend

Use the *Trend* dialog (Figure 54) to see a graphical view of the current selected device. This can be accessed from the menu or the *Device Selection* right-click menu. The trend can be customized to display certain data and data ranges.

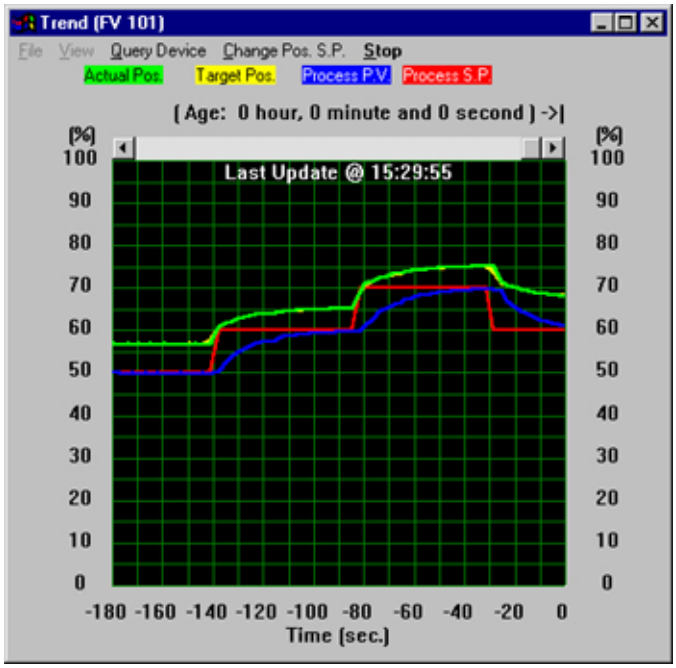

Figure 54 Trend Dialog

See “PID Block and Trending Services” on page 119.

PID Controller

The *PID Process Controller* dialog box (Figure 55) contains the tools for managing the PID function block. It is composed of frames that group controls and displays:

- The *PID Status* frame displays and controls the PID *States* (block modes), *Setpoint* and *Process Variable*, and the *Device tagname*. In Manual State (M), drag the PID output slider to move the valve. In Local State (L), drag the Setpoint Slider (or enter a value in the Setpoint text box) to change the process variable Set Point. In Cascade (C), and in Remote cascade (R), the Set Point is controlled by a function block or remote application.
- *Others* frame: Click **Change** to access the *Change PID Parameter* dialog to tune the *P*, *I* and *D* parameters. The *Alarm Status* fields display the actual pressure, cascade and remote cascade setpoints and turn red when in alarm.
- *PID Output and Valve Position*: Use the slider to tune the PID output and see the valve position above.

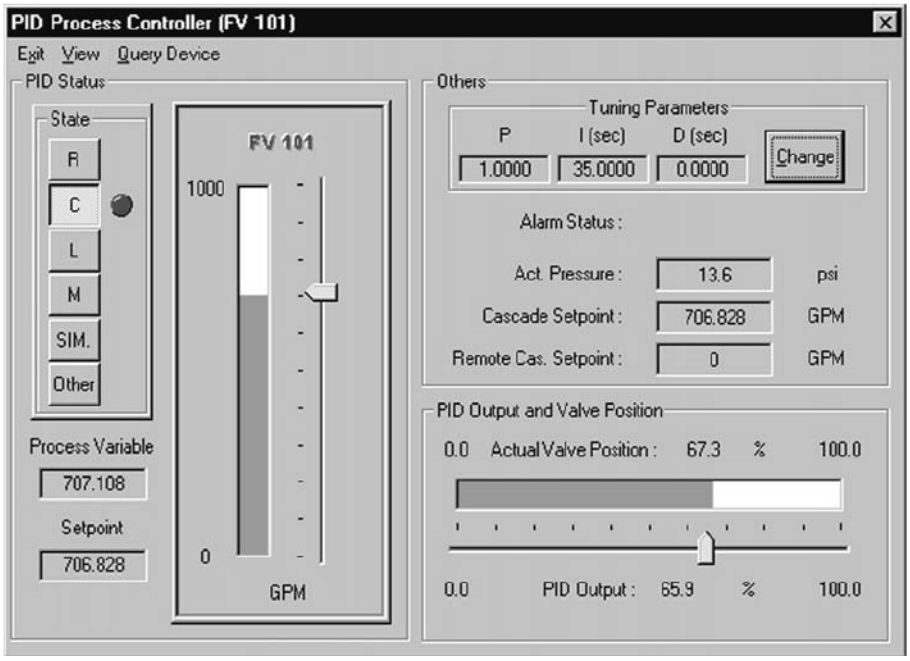

Figure 55 PID Process Controller Dialog Box

Change PID Parameters

The process loop tuning parameters are displayed in a frame (Figure 56). To change them:

1. Select **Change**, this displays the *Change PID Tuning Parameters* dialog box.
2. Tune while in the controller is one of the automatic control modes, L, C, or R, or when in Manual, or Other.

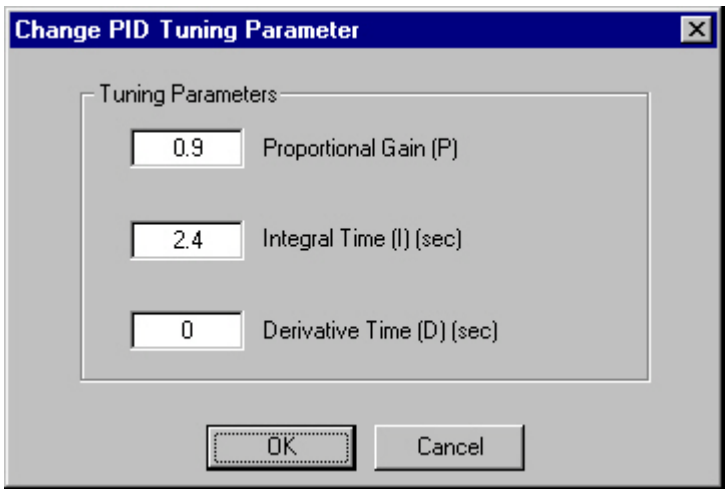

Figure 56 Change PID Tuning Parameters Dialog Box

Device Operation State

This dialog box (Figure 57) controls switching between the block modes as defined by the *Operation States*.

- *Normal* - The valve is controlled by the control configuration set in Foundation Fieldbus.
- *Manual* - The valve position can be set from ValVueFF.
- *Out of Service* - The valve position is controlled at the last Set Point but does not respond to inputs.

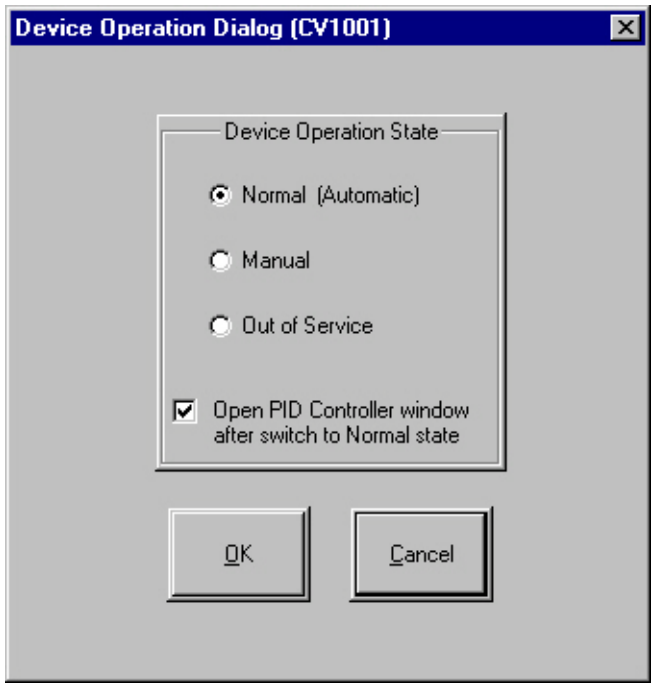

Figure 57 Device Operation Dialog Box

Tools Menu

- ❑ “Diagnostic Services” on page 62
- ❑ “Query Device” on page 63
- ❑ “Rescan Devices” on page 64

Diagnostic Services

Diagnostics (Figure 58) provides controls to perform actuator and positioner signature test procedures. It also displays the continuous diagnostic data that is an accumulation of valve service history. Refer to “Diagnostic Services” on page 135 for detailed information.

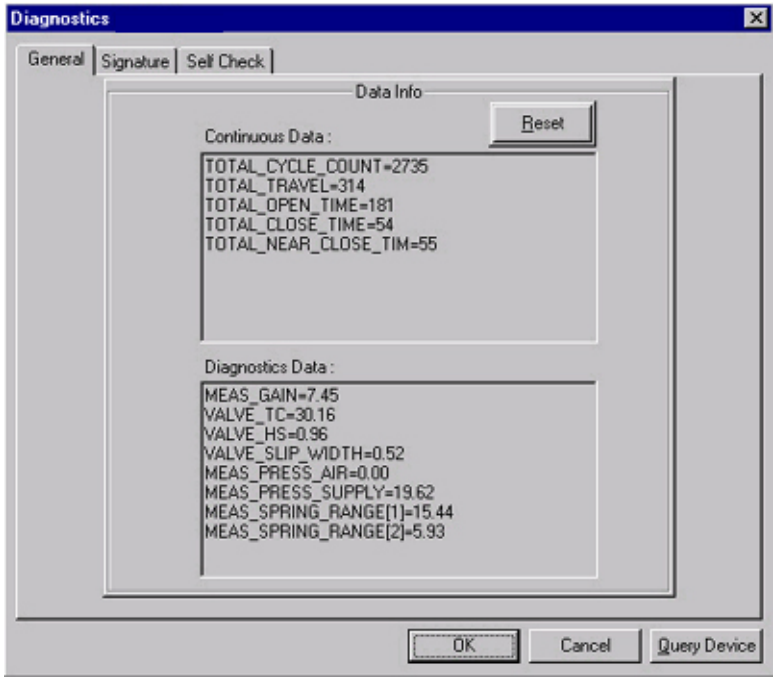

Figure 58 Diagnostic Services Dlalog Box

Query Device

Use the two tabs in the *Device Query* (Figure 59) to read parameters stored in the FVP. The *General* tab accesses general data, while the *Block Parameter* tab displays all parameters in each function block.

There is a query window available for each device. You can open multiple query windows for multiple positioner devices at the same time. The query window can be run while accessing other windows.

Use the *General* page to access device data in predefined categories:

1. Select the category name from the drop down list box.
2. Select **Read** to display all the parameter values in the category.

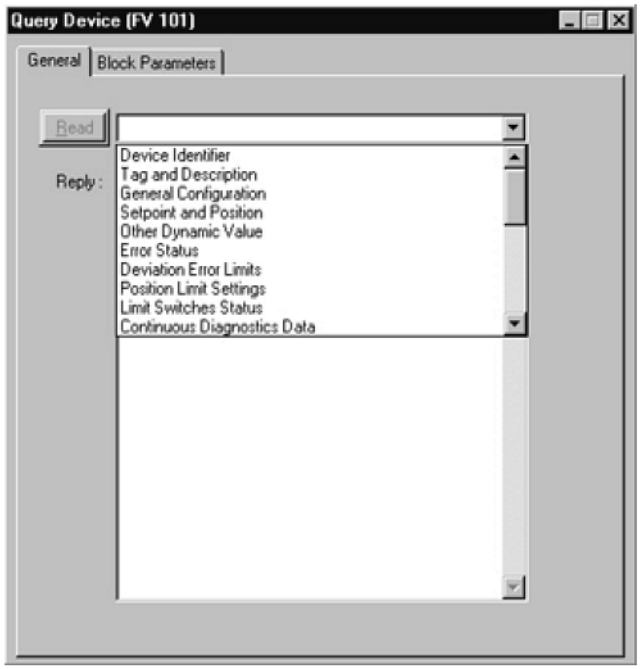

Figure 59 Device Query Dialog Box

Use the *Block parameters* page:

1. Select a block in *Select Block*.
2. Select **Read** to display all the parameter values.

Rescan Devices

Selecting or **Tools > Re-scan Devices** refreshes the connections to all working devices on the field- bus segment (Figure 60) and closes the opened device. You lose control until you have reselected a device. You are prompted to confirm that a rescan is acceptable.

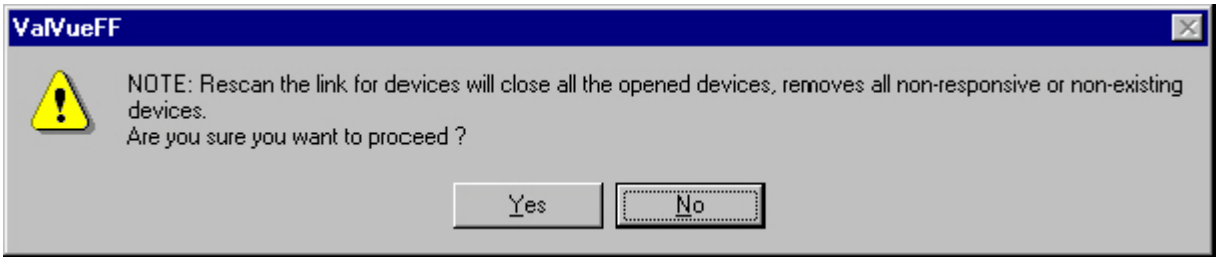
ValVueFF
NOTE: Rescan the link for devices will close all the opened devices, removes all non-responsive or non-existing devices.
Are you sure you want to proceed ?
Yes
No

Figure 60 Rescan Message Box

Multi-Link Environment

ValVueFF can only work with one segment each time. In a multiple link segments environment, before the IVI appears, a dialog appears (Figure 62):

Link Selection
Current environment has more than one link segment, please select one from the list:
interface0-0
E-LD PORT 1001
E-LD PORT 1002
OK

Figure 61 Link Selection

To open a link in a multi-link environment:

Link Selection
Current environment has more than one link segment, please select one from the list:
interface0-0
E-LD PORT 1001
E-LD PORT 1002
OK

Figure 62 Link Selection

1. Select segment.
2. Click **OK**.

Help Menu

This consists of:

- ❑ “About” on page 65
- ❑ “Registration Info” on page 65
- ❑ “Registration Info” on page 65

About

Selecting the About icon or selecting **Help > About ValVueFF** displays the version of ValVueFF and the copyright notice (Figure 63).

Figure 63 About ValVueFF Message Box

Registration Info

Select **Help > Registration Info** to open the *ValVueFF Registration* dialog.

Offline Use of ValVueFF

Choose **Offline** to work with configuration files when not connected to a positioner. Offline services allow files to be copied and modified as preparation for download to active devices. The user permission levels restrictions apply to offline use the same as when working with FVP positioners.

Setup Wizard Procedure

6

The *Setup Wizard* (Figure 64) is recommended for installing and configuring an FVP positioner. It is comprised of up to six steps:

- ❑ “Step 1: Welcome” on page 68 (required)
- ❑ “Step 2: Actuator Wizard” on page 69 (required)
- ❑ “Step 3: Tuning Wizard” on page 70 (required for initial valve configuration)
- ❑ “Step 4: Travel Calibration Wizard” on page 72
- ❑ “Step 5: Position Control Limits Wizard” on page 75
- ❑ “Step 6: Finish Setup Wizard” on page 77 (required)

Step 1: Welcome

To use the wizard:

1. Select **Setup > Setup Wizard** or click and the *Welcome* window appears (Figure 64).

Setup Wizard - Welcome (CV1002)
Welcome to Setup Wizard for FF based valve positioner !
This simple setup wizard will walk you through a basic configuration and calibration step by step to get the selected valve positioner up and running quickly. It requires the complete installation of the valve positioner on a control valve with actuator and air supply to complete this setup.
On each setup page, enter proper values for displayed parameters and follow the instruction to go through necessary steps.
Press Back button if you need to go back to previous setup page; press Next button if you are ready to proceed to next setup page when Next button is enabled.
Press Finish button at the last setup page when you need finish this setup.
Press Abort button will abort this setup and restore only the displayed parameters value.
< Back
Next >
Abort
Trend
Query Device

Figure 64 Setup Wizard Dialog Box

2. Select **Next** and the *Actuator* window appears (Figure 65).

Step 2: Actuator Wizard

1. Select the **Valve Action**, **Actuator Type**, **Relay Type**, and **Valve Type** (Figure 65).

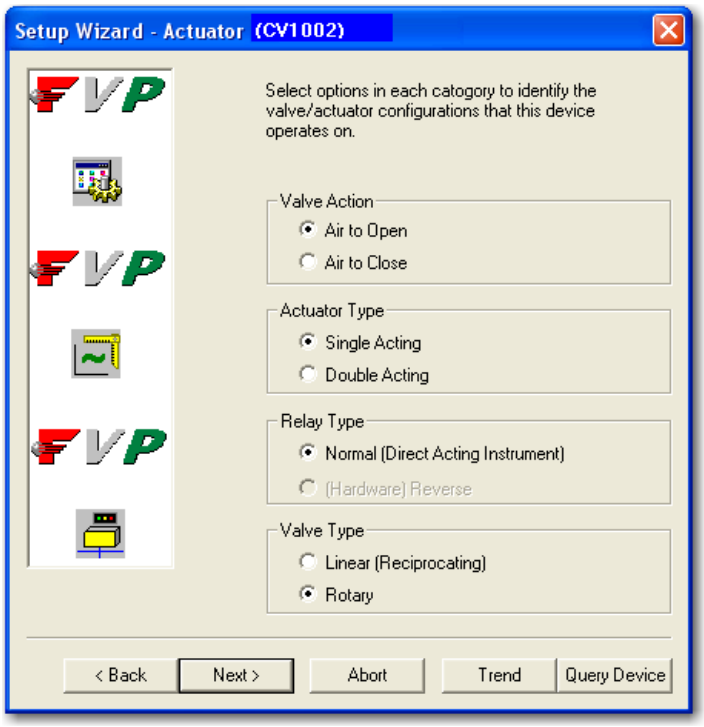

Figure 65 Actuator Wizard Dialog Box

2. Select **Next** to begin calibration and tuning.

NOTE

If linear is incorrectly selected, when the valve is rotary, a large angle error message displays. To correct this use the Configure Actuator dialog box followed by the Calibration Services Tuning dialog box.

Do not Auto Tune if manual tuning has been used. Auto Tune creates new parameters that override the manual tuning parameters.

WARNING

Before beginning the Auto or Manual range calibration, confirm that the valve is isolated from the process. This procedure exhausts and then fills the valve actuator to supply pressure and therefore strokes the valve over its full range. Supply pressure MUST NOT exceed the actuator pressure rating marked on the actuator. Positioner supply pressure MUST BE at least 5 psi higher than the upper spring range of the valve.

Step 3: Tuning Wizard

The positioner automatically searches for the mechanical valve travel limits and tunes the valve position PID control algorithm (Figure 66).

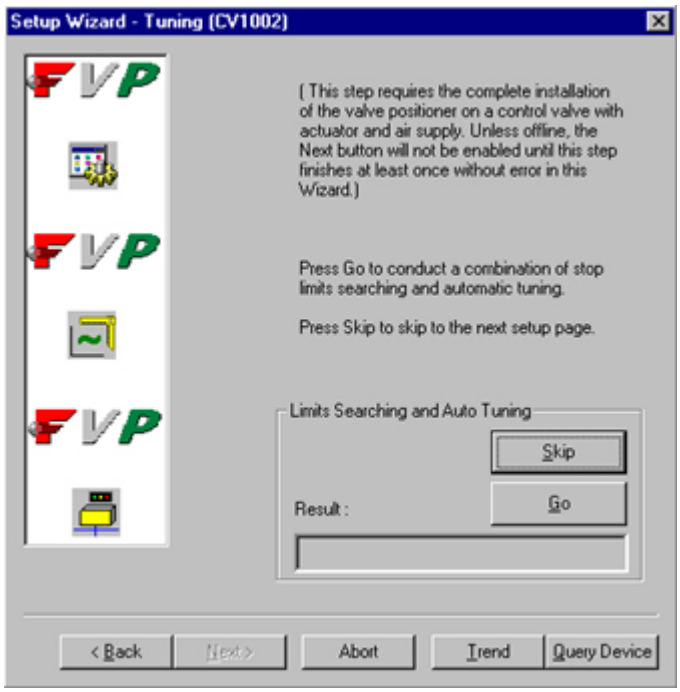
Setup Wizard - Tuning (CV1002)
(This step requires the complete installation of the valve positioner on a control valve with actuator and air supply. Unless offline, the Next button will not be enabled until this step finishes at least once without error in this Wizard.)
Press Go to conduct a combination of stop limits searching and automatic tuning.
Press Skip to skip to the next setup page.
Limits Searching and Auto Tuning
Skip
Result :
Go
< Back
Next >
Abort
Trend
Query Device

Figure 66 Tuning Wizard Dialog Box

1. Ensure the air supply to the valve must be on and set to the correct pressure.
2. Select **Go**. This takes several minutes to complete and strokes the valve. If this is not a first time setup of the valve, skip this step by selecting the **Skip** button. The following list details actuators that must be tuned manually. Look for a *Manual Tune Only* notice in the TB block tag descriptor. Actuators that may require manual tuning:
   - ❑ Actuators with internal leaks, such as pistons.
   - ❑ Large actuators with high spring ranges.

Auto Tune is successful for most valves. However, very large actuators or high hysteresis may require manual tuning. If *Limit Searching* and *Auto Tune* are performed successfully the *Tuning Result* dialog box displays for your confirmation (Figure 67).

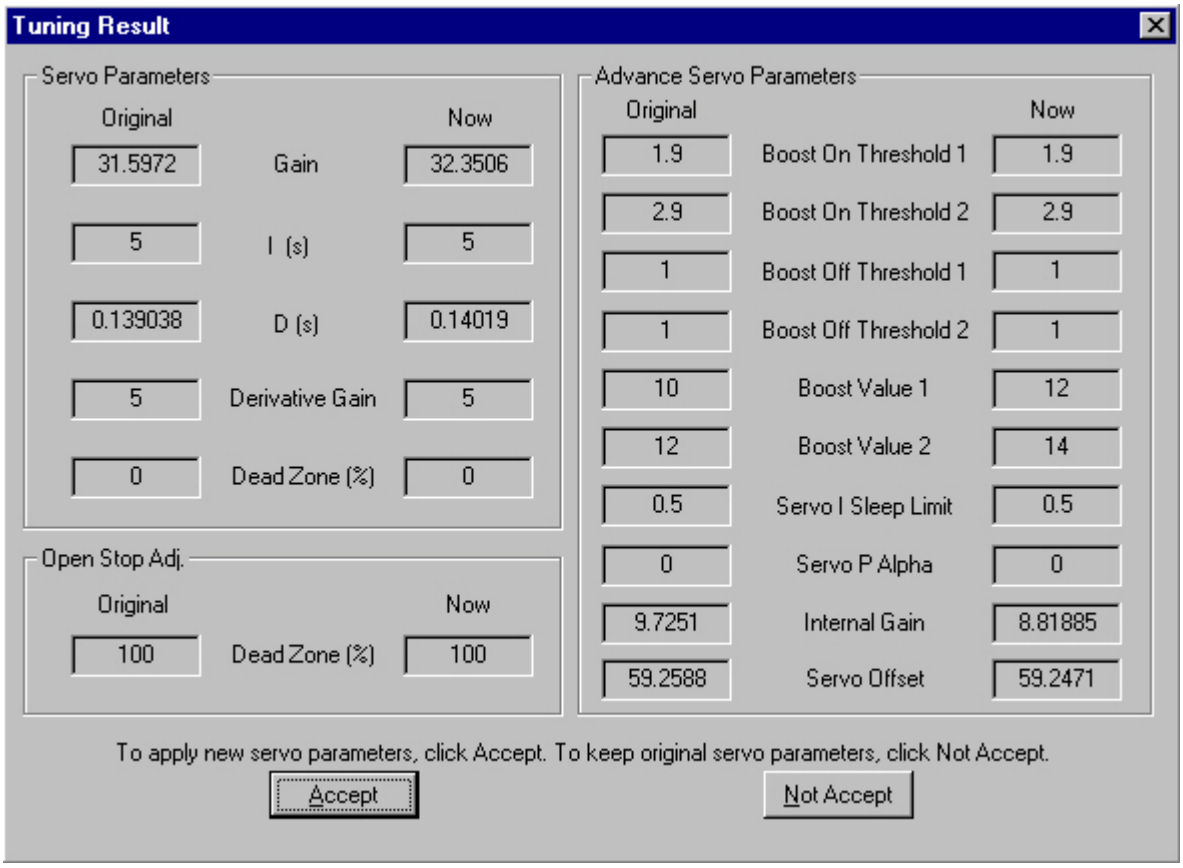

Figure 67 Tuning Results Dialog Box

3. Select **Accept** applies new parameters or select **Not Accept** to keep your original parameters.

If the tuning fails there is an additional message describing why the failure occurred. If the self calibration and Auto Tune procedures are unsuccessful there is a message (Figure 68).

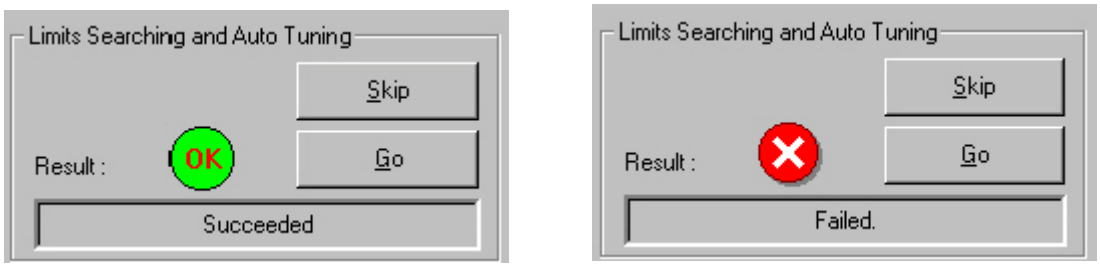

Figure 68 Tuning Wizard Message Boxes

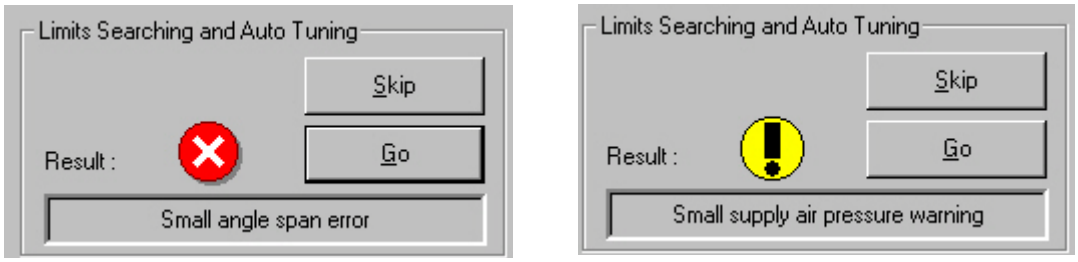

Figure 69 Tuning Wizard Error Message Boxes

NOTE

*Before running the Travel Calibration Wizard checks that Tight Shut Off, Full Open, and Position Limits are disabled. Select **Next** to see the Position Control Limits Wizard, shown in Figure 71. Select Back to return to the Travel Calibration Wizard. If changes are needed select Next to complete the Wizard and install the changes. Restart the Setup Wizard.*

Step 4: Travel Calibration Wizard

The mechanical stops on some actuators may allow the valve to move beyond it's rated travel. The next wizard allows adjustment of the valve travel to correspond to the travel indicator on the actuator. In the example shown the valve has been moved to 100% travel mark on the actuator by trial and error. The FVP positioner indicates that the position corresponding to 100% rated travel is 93.5% of the measured mechanical travel. If this is correct select the span control and select **Apply Calibration**. Select **Yes** to the confirmation dialog box *Are you sure you want to apply travel calibration?*. This method is also used to adjust the 0% position to correspond to the valve's actual closed position and to correct nonlinear travel by adjusting the position at which the valve is 50% open.

If *Travel Calibration* is used to modify valve travel, the initial values shown in Figure 70 may require corresponding modifications. For example, if the travel has been short stroked so that at 100% calibrated travel the valve is at 80% of mechanical limits, increase the *Full Open Above* and *Position Upper Limit* values to 138% (110%/.8). Similarly, if the valve is calibrated to allow over-travel at the valve seat, reduce *Tight Shutoff* and *Position Lower Limit*. For example, if the valve is closed at 12% of mechanical travel, then reduce *TS* and *Position Low Limit* to -22%.

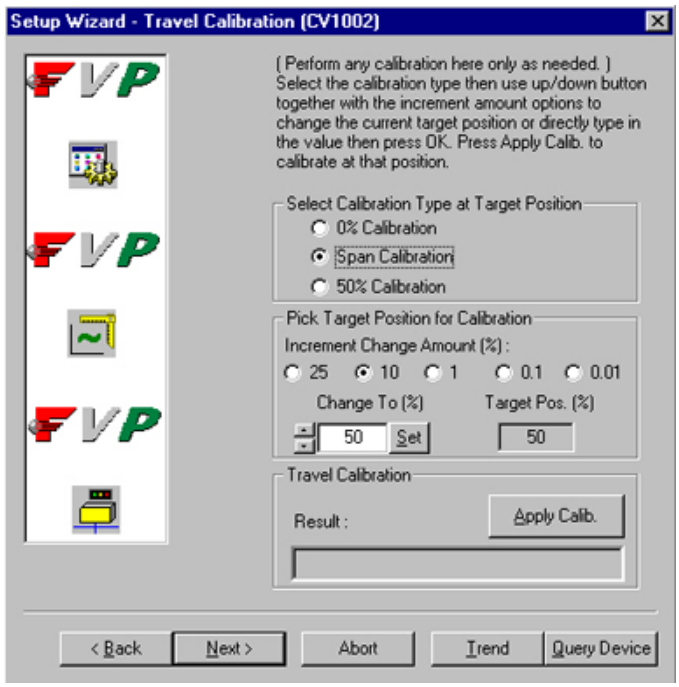

Figure 70 Travel Calibration Wizard

CAUTION

Supply pressure must not exceed the actuator pressure rating marked on the actuator. Positioner supply pressure must be at least 5 psi higher than the upper spring range of the valve.

WARNING

Isolate the valve from the process and keep clear of moving parts before using Limit Searching or Auto Tune.

To run the *Travel Calibration Wizard*:

1. Check that the *Tight Shut Off*, *Full Open Features*, and the *Position Limits* are disabled by:
   a. Clicking **Next** and the *Position Control Limits* window appears.
   b. Setting parameters to disable the above, close and reopen the wizard and navigate back to the *Travel Calibration*.

CAUTION

These values alter the valves performance. Use them with caution.

2. Perform a *Select Calibration Type at Target Position*, if required, by:
   a. Clicking either:
      - ❑ **0% Calibration**
      - ❑ **Span Calibration**
      - ❑ **50% Calibration**
   b. Clicking **Apply Calib.**
3. Perform a *Pick Target Position for Calibration*, if required, by:
   a. Clicking either:
      - ❑ **25**
      - ❑ **10**
      - ❑ **1**
      - ❑ **0.1**
      - ❑ **0.01**
   b. Using the *Change To* up/down arrows to select a *Target Pos*.
   c. Clicking **Apply Calib.** and the *Result* appears.
4. Select **Next**.

Step 5: Position Control Limits Wizard

To use this:

1. Enter values as required in Figure 71, referring to the descriptions given in “Position Limits Parameters” on page 75.

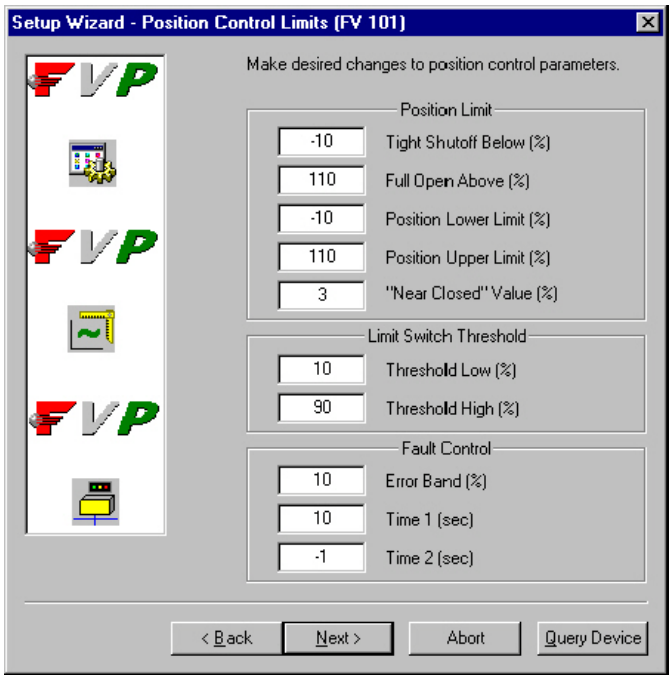

Figure 71 Position Control Limits Wizard

2. Select **Next**.

Position Limits Parameters

Tight Shutoff Below (%)	If the valve position Set Point is less than this value the valve is forced to fully close. As a general practice this is set between 1 and 3 to minimize seat leakage. The dead band is a function of this setting, typically between 1/10th and 1/100th of the setting. The TSB feature is designed to prevent leakage of valves when the Set Point is 0%.
Full Open Above (%)	If the valve position Set Point is more than this value the valve is forced to fully open.
Position Lower Limit (%)	The valve position Set Point cannot be less than this value. This prevents the valve from closing. Use only when required by the control strategy.
Position Upper Limit (%)	The valve position Set Point can not exceed this value. This prevents the valve from closing.

Near Closed Value (%)

The threshold below which the valve is considered near closed. Near Closed is useful for estimating when to change the valve trim. This value does not effect valve travel it is used only for reporting the time that valve is near the seat.

Limit Switch Threshold

The limit switch thresholds apply to the Discrete Input Block (DI) Set Points.

- ❑ *Threshold Low* -Threshold for low limit switch that is communicated by the Discrete Input Block (DI).
- ❑ *Threshold High* -The threshold for the high limit switch that is communicated by the Discrete Input Block (DI).

NOTE

When Tight Shutoff Below is configured to a positive value small flows are not controllable.

When Full Open Above is configured to a value of less than 100% large flows are not controllable. At the configured Full Open Above setting the flow jumps to the greatest possible value.

Fault Control

- ❑ *Error Band* - The position deviation limit to start deviation timer of Time 1 and Time 2.
- ❑ *Time 1* - Position deviation time limit to show the block alarm. A negative value turns off this function.
- ❑ *Time 2* - Position deviation time limit to trigger the failsafe action. Enter -1 to disable the function. A negative value turns off this function. Using Time 2 failsafe can result in unwanted process shutdowns.

CAUTION

Use the Time 2 failsafe only for a critical process that must be forced to its failsafe position if the valve is unable to respond to its position setpoint after a reasonable time delay. Do not set the error band to a value that is too small. If time 2 is used it must be longer than the valve stroking time. TIme 2 value that is too small results in nuisance failsafe behaviour

Step 6: Finish Setup Wizard

This screen (Figure 72) indicates that the setup is valid:

1. Select a **Device Operation State**.

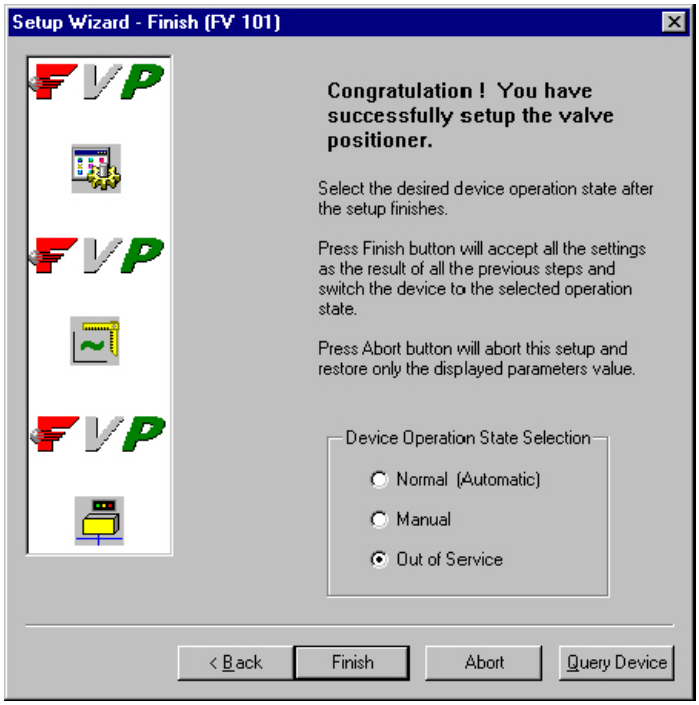
Setup Wizard - Finish (FV 101)
Congratulation ! You have successfully setup the valve positioner.
Select the desired device operation state after the setup finishes.
Press Finish button will accept all the settings as the result of all the previous steps and switch the device to the selected operation state.
Press Abort button will abort this setup and restore only the displayed parameters value.
Device Operation State Selection
Normal (Automatic)
Manual
Out of Service
< Back
Finish
Abort
Query Device

Figure 72 Finish Setup Dialog Box

2. Select **Finish**.

This page intentionally left blank.

Configuration Services

7

Configuration

Configuration services provide the tools to read and set a large number of parameters required for successful communications and control. Each set of tools is grouped in a tabbed page. The Configuration dialog box contains six tabs (Figure 73):

General Used to name and describe function blocks and related devices.

Position Used to setup configuration parameters.

Actuator Used to set advanced position control parameters.

AO Block Used to control Set Point limits

PID Block Used to set parameters in the PID block

Options Used to configure remaining settings including pressure range and bumpless transfer.

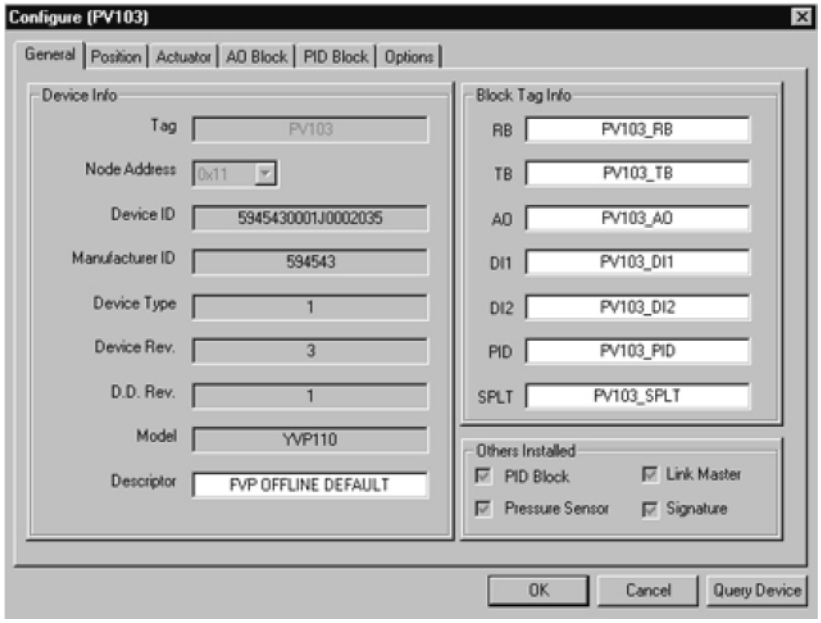

Figure 73 General Tab - Configuration Dialog Box

CAUTION

Don't turn off power for 60 seconds after writing configuration data. Data cannot be saved. See the positioner instruction manual.

Do not change Device Tag or Node Address while the NI Configurator or other host software is running. Only change Network parameters when configuring a positioner connected to a segment that is not controlling a process.

General Page

Use the *General* tab to enter tagnames for each of the function blocks in the PIDFVP and to enter a valve or positioner description.

Device Info

Tag — The physical device tag (*PD-Tag*). The device tag is defined in Foundation Fieldbus as a string of 32 characters, maximum. The tag must be unique in the entire control network. When a device is selected this field grays as read only. The device tag change is done in the main screen (IVI) by selecting the **Tools** menu or by right-clicking the device icon in *Device Selection*. Always change device tag with the device off control. Use a configurator to connect function blocks after a tag change.

Node Address — The node address of the physical device on the fieldbus segment. The device address is defined in Foundation Fieldbus as a value between 1 and 255. The address must be unique in the segment. When a device is selected this field grays out as read only. The device address change is done in main screen (IVI) by selecting the *Tools* menu or by right-clicking the device icon in *Device Selection*.

Link Master devices are normally at addresses beginning with 0x10 (16). Basic devices are normally at addresses 0xE0 (224) to 0xF7 (247). Addresses 0xF8 (248) to 0xFF (255) are reserved for visitor devices which are automatically reassigned to a basic device address. Refer to address range definition in Foundation Fieldbus specification.

Device ID — This number consists of manufacturer id number, device number and device model related number. It is unique in all the devices among manufacturers and is read only.

Manufacturer ID — The 6 digits number of the device manufacturer ID is assigned by the Fieldbus Foundation and is read only.

Device Type — The type of the device is read only.

Device Rev. — The revision of the device is read only.

D. D. Rev.	The revision of the *Device Description* is read only.
Model	The model of the device is read only.
Descriptor	Use this field for a device description or for a memo (28 char. max).

Block Tag Info

Each block is assigned a default tag-name that should be renamed by the user.

RB	The tag of the device resource block.
TB	The tag of the device transducer block.
AO	The tag of the device analog output block.
DI1	The tag of the device discrete input 1 block.
DI2	The tag of the device discrete input 2 block.
PID	The tag of the device PID block.
SPLT	The tag of the device Output Splitter Block.

CAUTION

Do not change the device tagname or the node address of a device in an operating Foundation Fieldbus segment. Control linkages are lost. Do not use a leading space in a device tag name, this causes the device to become non-operational. Block tags are not used for control linkages. They can be changed without losing control linkages. However, some applications require restarting if another application changes a block tag.

Others Installed

PID Block	Checked when the device PID block is activated. Read only.
Pressure Sensor	Checked when the device pressure sensor is installed. Read only.
Link Master	Used to control communications on the fieldbus.
Signature	Used to measure and maintain characteristic data.

Position Tab

Use this tab (Figure 74) for the setting up the Transducer Block (TB) valve position configuration parameters.

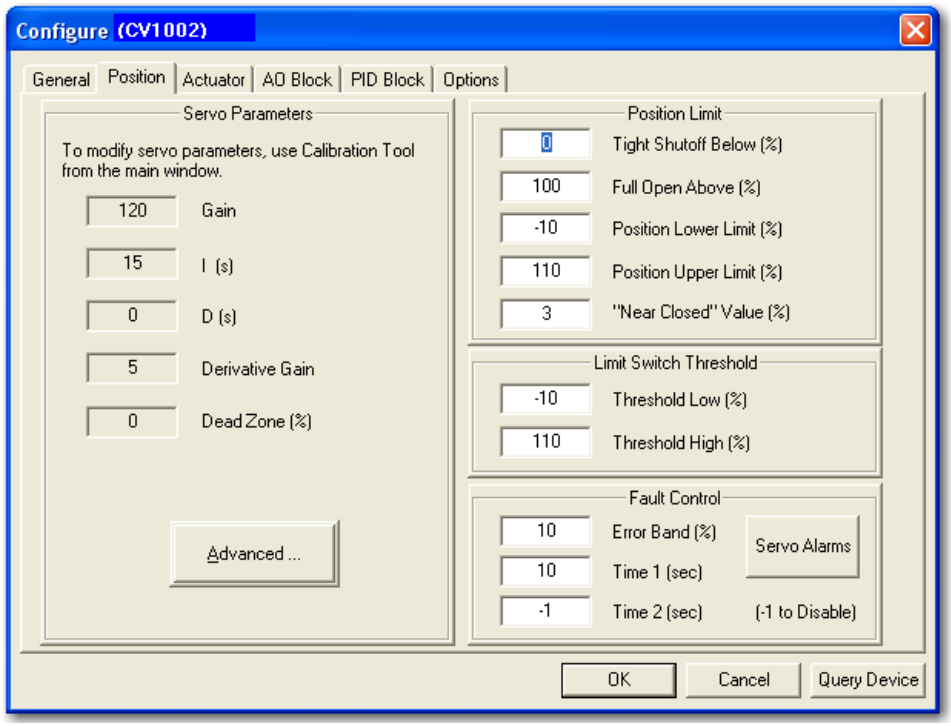

Figure 74 Position Tab - Configuration Dialog Box

Servo Parameters Frame

The servo parameters are normally set by Auto Tune in Tuning or Calibration. They determine the dynamic response of the valve position control.

Advanced Position Configuration

This is the read-only page (Figure 75) for Transducer Block (TB) advanced position control parameters. To modify the value of any parameter, go to “Advanced Tab” on page 115.

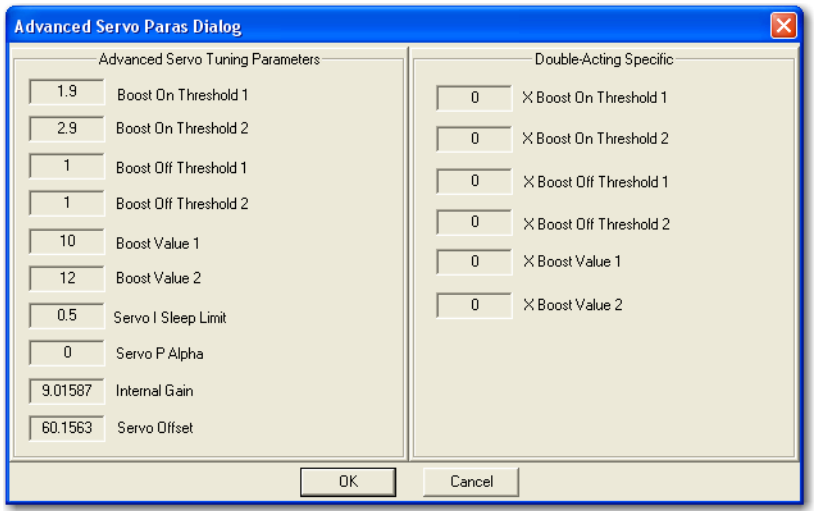

Figure 75 Advanced Servo Tuning Parameters

Advanced Servo Tuning Parameters

Boost On Threshold 1 Control parameter to reduce the effect of deadband in the control relay.

Boost On Threshold 2 Control parameter to reduce the effect of deadband in the control relay.

Boost Off Threshold 1 Control parameter to reduce the effect of deadband in the control relay.

Boost Off Threshold 2 Control parameter to reduce the effect of deadband in the control relay.

Boost Value 1 Control parameter to reduce the effect of deadband in the control relay.

Boost Value 2 Control parameter to reduce the effect of deadband in the control relay.

Servo I Sleep Limit Control parameter to prevent unnecessary overshoot for large step inputs.

Servo P Alpha Control parameter to adjust the gain under very large hysteresis condition.

Internal Gain Displays the total gain for the I/P module, control relay and valve.

Servo Offset Initial value of the integrator.

Position Limits Frame

Use the *Position Limits* frame (Figure 74) parameters to limit the valve, force the valve to close tightly or open fully at specified positions, and to set the trip points of the limit switches (DI block). You can also activate a warning when a deviation lasts longer than *Time 1* or to force the valve to it's failsafe position if the deviation lasts longer that *Time 2*.

CAUTION

Position Limit parameters are powerful tools to alter the valve performance to be non-linear. Use them with caution and only when the process requires special performance.

When Tight Shutoff below is configured to a positive value, small flows are not controllable.

Tight Shutoff Below (TSB) — If the valve *Target Position* is less than this value, the valve is forced to fully close. A value of -10 removes this function from the normal travel range, unless the calibration of valve travel has been readjusted. Set this between 1 and 3 to minimize seat leakage.

Full Open Above (FOA) — If the valve *Target Position* is more than this value, the valve is forced to fully open. A value of 110 removes this function from the normal travel range.

Position Lower Limit — The valve *Target Position* must not be less than this value. This prevents the valve from closing. Use only when required by the control strategy. A value of -10 removes this function from the normal travel range.

Position Upper Limit — The valve *Target Position* must not exceed this value. A value of 110 removes this function from the normal travel range.

CAUTION

Use of Full Open Above at values less than 110 can result in rapid increase in flow rate if input reaches this value. Use with extreme caution.

Near Closed Value — The threshold below which the valve is considered near closed. *Near Closed* is useful for estimating when to change the valve trim. This value does not effect valve travel it is used only for reporting the time that valve is near the seat.

Determining Values to Disable Tight Shutoff Below, Full Open Above, and Limits

If *Travel Limits* have been readjusted after performing *Find Stops*, then the values that disable the *Tight Shutoff Below, Full Open Above, Position Lower Limit*, and *Position Upper Limit* functions must be determined by testing the limits. To disable these functions, set them 10% above the full open mechanical stop position or 10% below the fully closed mechanical stop position.

Limit Testing

1. Isolate the valve from the process.
2. Place the FVP in Manual Operating State. The valve must be calibrated and supplied with correct supply pressure.
3. Measure closed position by:
   a. Entering a *Set Point* of *-10*%.
   b. Wait for the valve to reach it's final value and record the actual position of the closed mechanical stop. The actual position must be less negative than the target position to verify the valve has reached the stop. If the actual position and target position are equal, reduce the *Set Point* until the valve reaches the stop.
4. Disable *Tight Shutoff Below* and *Position Lower* Limit by deducting 10% from the recorded value.
5. Measure open position by:
   a. Entering a *Set Point* of *110*%.
   b. Wait for the valve to reach it's final value and record the actual position of the open mechanical stop. The actual position must be less than the target position to verify the valve has reached the stop. If the actual position and target position are equal increase the *Set Point* until the valve reaches the stop.
6. To disable *Full Open Above* and *Position Upper Limit* add 10% to the value recorded above.

Limit Switch Threshold

The *Limit Switch* thresholds apply to the Discrete Input Block (DI) Set Points.

Threshold Low	Threshold for the low limit switch that communicates by the DI.
Threshold High	Threshold for the high limit switch that is communicated by the DI.

Fault Control

Error Band	The position deviation limit to start *Time 1* deviation timer and *Time 2*. Set this value to a value that is exceeded only in abnormal performance.
Time 1	The position deviation time limit to show the block alarm. A negative value turns off this function. Set this value greater than the stroking time.
Time 2	The position deviation time limit to trigger the failsafe action. A negative value turns off this function.

CAUTION

Use the Time 2 failsafe only for a critical process that must be forced into its failsafe position if the valve is unable to respond to its position Set Point after a reasonable time delay. Do not set the error band to a value that is too small. If Time 2 is used it must be longer than the valve stroking time. A Time 2 value that is too small results in a nuisance failsafe behavior.

Servo Alarms

Use this dialog (Figure 76) to configure the warning high and low thresholds and maximum duration. Servo alarm parameters are for double acting only.

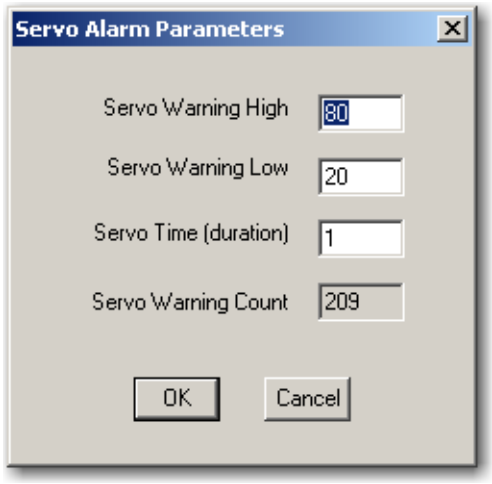

Figure 76 Alarms

Servo Warning High	Enter the maximum as a percent of servo operational limit.
Servo Warning Low	Enter the minimum as a percent of servo operational limit.
Servo Time (duration)	Enter the maximum number of minutes per operation.
Servo Warning Count	Displays the number of warnings issued for all three configurable conditions.

Actuator Page

The *Actuator* tab (Figure 77) displays Transducer Block (TB) valve actuator and diagnostics limit information and details the valve and actuators manufacturer, model number and serial number. This is important when calling for service or replacement parts.

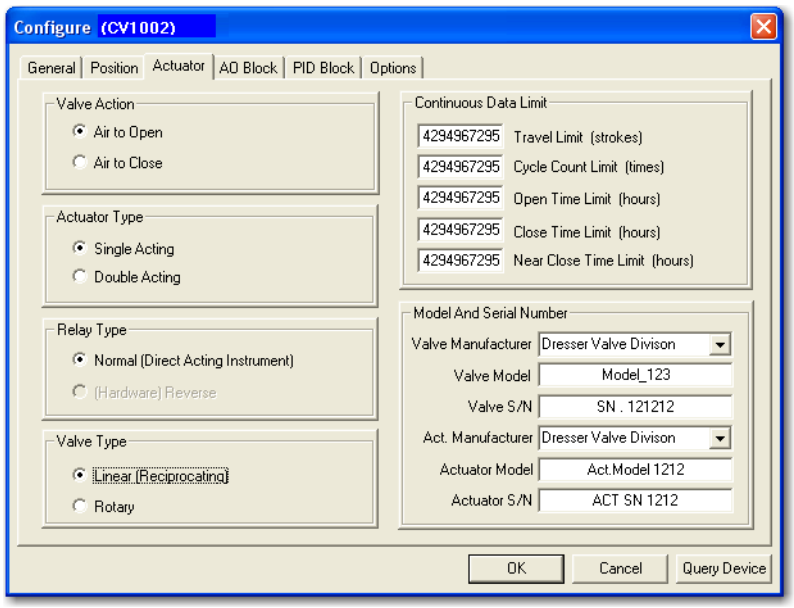

Figure 77 Actuator Tab-Configuration Dialog Box

Valve Action

Air To Open	Specifies the final failure position of the actuator as self-closing or air-to-open.
Air To Close	Specifies the actuator as self-opening or air-to-close.

Actuator Type

Single Acting	Specifies the actuator as single acting type.
Double Acting	Specifies the actuator as double acting type.

Relay Type

Normal (Direct Acting Instrument)	Specifies the control relay as normal type.
(Hardware) Reverse	Specifies the control relay as reverse type (not available).

Valve Type

Linear	Specifies the valve as linear (reciprocating) type.
Rotary	Specifies the valve as rotary type.

Diagnostic Parameters

The following diagnostic parameters can be set to values useful to notify if service is needed.The maximum (default) value for each of the continuous data limits is 2^32-1 (4294967295). Enter realistic values that represent useful maintenance life values.

Travel Limit (strokes)	Total travel limit to show the block alarm.
Cycle Count Limit (times)	Total cycle count limit to show the block alarm.
Open Time Limit (hours)	Total valve open time limit to show the block alarm.
Close Time Limit (hours)	Total valve close time limit to show the block alarm.
Near Close Time Limit (hours)	Total valve near close time limit to show the block alarm.

Model and Serial Number

Both the valve and actuator manufacturer, model number and serial numbers appear.

NOTE

AO block setpoint limits do not apply to Set Point when in Manual Operating State. The AO Block set- point limits are different from the Position limits configured in the Configure Position tab. The Position Limits apply to Target Position.

AO Block Tab

Use this tab (Figure 78) to set limits on the Set Point received from another function block in (Cas) or a remote application (RCas). The rates at which the Set Point is permitted to move up and down can also be limited.

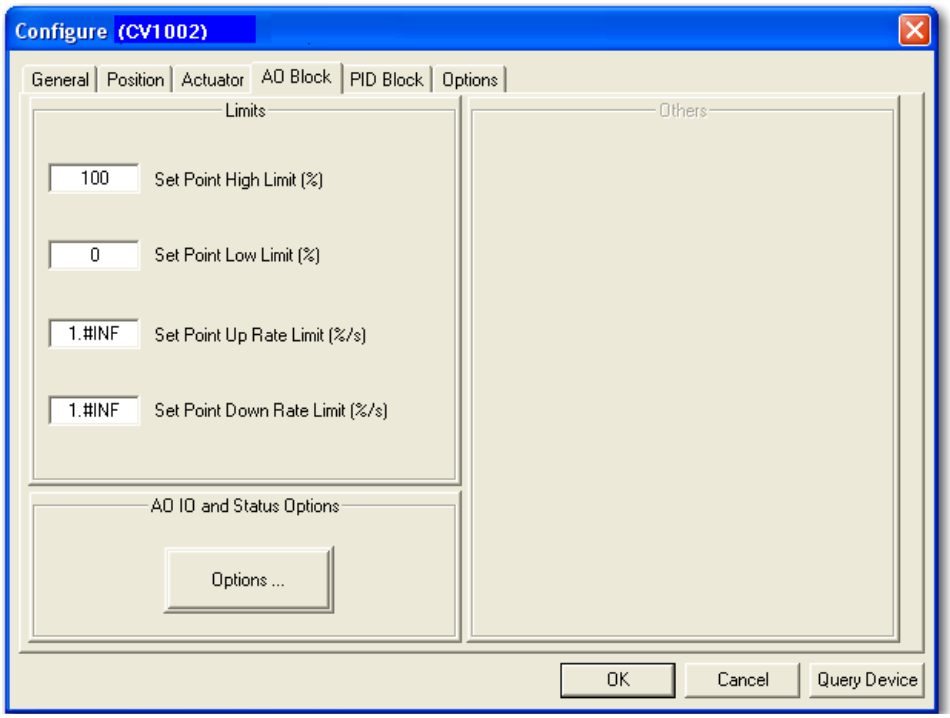

Figure 78 AO Block Tab-Configuration Dialog Box

Limits

AO Set Point High Limit (%)

Use this to limit the Set Point from another function block or remote application.

The limits applied in the *Configure Position* dialog box act on the *Target Position*, not on the Set Point.

AO Set Point Low Limit (%)

Use this limit to prevent the valve from closing in response to the Set Point from another function block or remote application.

Set Point Up Rate Limit (%)

Ramp rate where the upper Set Point changes are acted on, in Auto mode, at PV unit per second. If the ramp rate is set to zero or the block is in a mode other than Auto, the Set Point is used immediately.

The Set Point from another function block or remote application can also be limited to change at a configurable ramp rate. The ramp rate up and the ramp rate down can be individually configured. The default value is 1.#INF (infinity), which eliminates ramp rate limiting.

AO Set Point Down Rate Limit (%) See Set Point Up Rate Limit (%).

AO Block Options

This dialog box (Figure 79) consists of both *A/O I/O Options* and *A/O Status Options*. IO OPTS and STATUS OPTS are parameters that control options about the Analog Output Block (AO)'s signal processing and mode transitions.

Using *AO Status Options* sends the quality of the status of BKCAL OUT to Bad and its sub-status is set to sensor failure. The BKCAL OUT value is not affected. The Analog Output Block (AO) does not alarm (but enables an upstream block to alarm). When this option is not selected, then the quality of BKCAL OUT is set to Bad and its sub-status is set to non specific. A block alarm is generated by the Analog Output Block (AO).

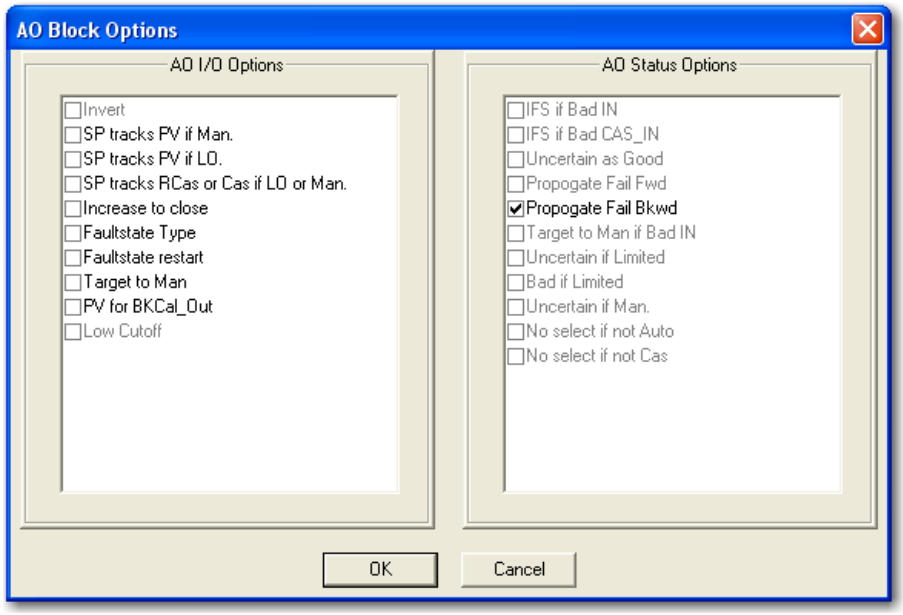

Figure 79 Analog Output Block Options Dialog Box

SP-PV Track in Man Permits the Set Point to track the process variable when the target mode of the block is Man.

SP-PV Track in LO Permits the Set Point to track the process variable when the actual mode of the block is LO.

SP Tracks RCas or Cas if LO or Man (SP Track retained target) In LO mode, SP is set to RCAS IN if target mode is RCas. SP is set to CAS IN if target mode is Cas.

Increase to close Indicates whether to invert the output value before it is communicated to the TB I/O channel. Inverts the SP signal before passing it to OUT.

Faultstate Type	The output action to take when a fault occurs. Uncheck to freeze, check to go to a preset value. The initial preset value is 0. To change this parameter use a configurator to change *FSTATE VALUE* in the Analog Output Block (AO). Zero (0) is recommended for an air-to-open actuator and 100 is recommended for an air to close actuator.
Faultstate restart	At a restart, uses the same value that is preset for fault state type.
Target to Man (if Faultstate activated)	Sets the target mode to Man, you lose the original target, if *Fault State* is activated. This latches an output block into the manual mode.
(Use) PV for BKCAL OUT	The BKCAL OUT value is normally the working Set Point. This option changes it to the PV. Sets the value of PV in BKCAL OUT and RCAS OUT.
Propagate Fail Bkwd (Fault Backward)	Controls the handling of the value, data status and related alarm of BKCAL OUT and RCAS OUT.

PID Block

This page (Figure 80) is used to setup the PID process controller configuration parameters mainly in the PID block.

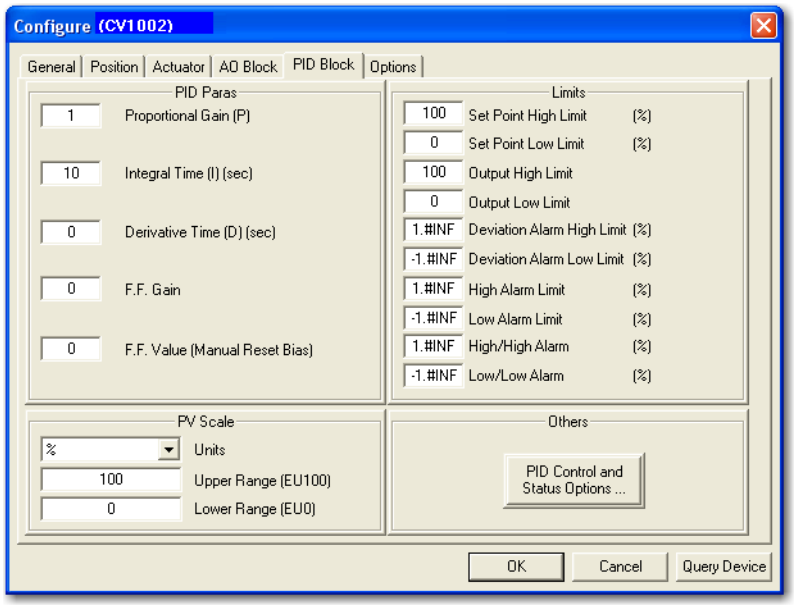

Figure 80 PID Block Tab-Configuration Dialog Box

PID Paras

Proportional Gain	Dimensionless value used by PID block algorithm to calculate a block output.
Integral Time	The integral time constant, in second per repeat.
Derivative Time	The derivative time constant, in seconds.
FF Gain	The gain applied to an optional feed-forward input before it is added to the calculated control output.
FF Value (Manual Reset Bias)	The optional feed-forward value.

Limits

Set Point High Limit	The highest value allowed for the PID set point.
Set Point Low Limit	The lowest value allowed for the PID set point.
Output High Limit	The limit for the maximum PID output value.
Output Low Limit	The limit for the minimum PID output value.

Output Rate High Limit	This is the ramp rate at which upward Set Point changes are acted on in Auto mode, in PV units per second. If the ramp rate is set to zero, then the setpoint is used immediately. For control blocks, rate limiting applies in Auto, Cas and RCas modes.
Output Rate Low Limit	This is the ramp rate at which downward Set Point changes are acted on in Auto mode, in PV units per second. If the ramp rate is set to zero the set- point is used immediately. For control blocks, rate limiting applies in Auto, Cas and RCas modes.
High Alarm Limit	This is the setting of the high deviation alarm limit in engineering units.
Low Alarm Limit	This is the setting of the low deviation alarm limit in engineering units.
High/High Alarm	This is the setting of the high high alarm in engineering units.
Low/Low Alarm	This is the setting of the low low alarm in engineering units.
PV Scale	
Units	The engineering units used for PID process variable.
Upper Range (EU100)	This is the upper range of the PV_SCALE in the selected engineering unit value.
Lower Range (EU0)	This is the lower range of the PV_SCALE in the selected engineering unit value.

PID Control and Status Option

Select the **PID Control and Status Options** button to open the controller options dialog box (Figure 81). This dialog box consists of PID *Control Options* and *Status Options*. Refer to Foundation Fieldbus specifications for further information.

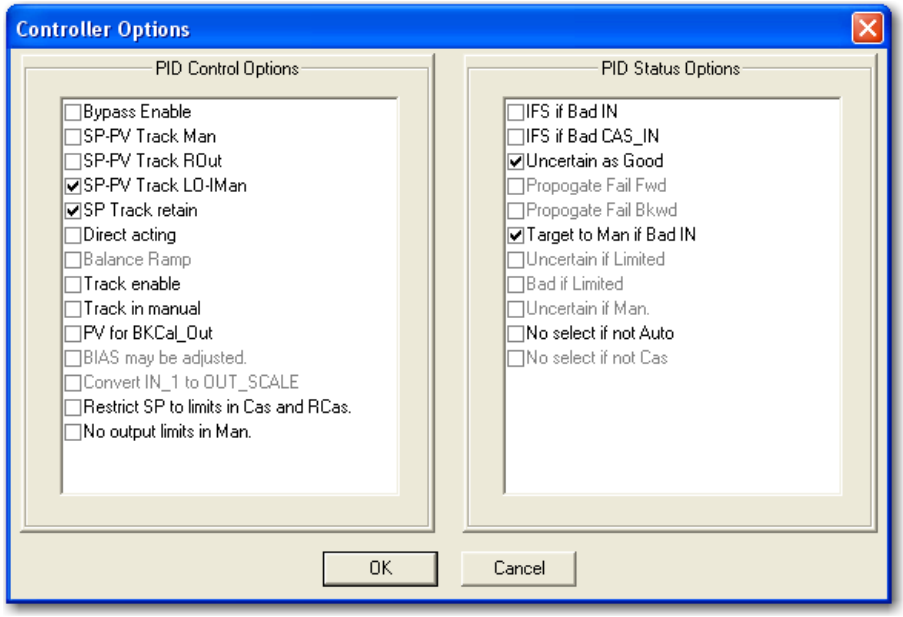

Figure 81 PID Control and Status Options

PID Control and Status Options

PID Control Options

Bypass Enable The normal control algorithm can be bypassed using the BYPASS parameter. When bypass is set the Set Point value, in percent, is directly transferred to the output. To prevent a bump on transfer to/from bypass, the Set Point is automatically initialized to the output value or process variable and the path broken flag is set for one execution. BYPASS is not permitted unless the BYPASS ENABLED option is set.

SP-PV Track Man Permits the Set Point to track the process variable when the target mode of the block is Man.

SP-PV Track ROut Permits the Set Point to track the process variable when the actual mode of the block is ROut.

SP-PV Track LO-IMan Permits the Set Point to track the process variable when the actual mode of the block is LO or IMan.

SP Track Retain	Permits the Set Point to track the RCAS or CAS parameter based on the retained target mode when the actual mode of the block is IMan, LO, Man, or ROut. When SP-PV track options are enabled, then SP Track retained target has precedence in the selection of the value to track when the actual mode is Man, IMan, Rout, and LO.
Direct Acting	Defines the relationship between a change in PV and corresponding change in output. When Direct is selected, an increase in PV results in an increase in the output.
Balance Ramp	(Not used- reserved)
Track Enable	This enables the external tracking function. If true, the value in TRK VAL replaces the value of OUT if TRK IN D becomes true and the target mode is not Man.
Track in Manual	This enables TRK VAL to replace the value of OUT when the target mode is Man and TRK IN D is true. The actual mode is then LO.
PV for BKCAL OUT	The BKCAL OUT and RCAS OUT values are normally the working SP. If this option is enabled the PV value is used after the cascade is closed.
Restrict SP to limits in CAS or RCAS	Normally the Set Point is not restricted to the setpoint limits except when entered by a human interface device. However, if this option is selected, the Set Point is restricted to the setpoint absolute limits in the Cas and RCas modes.
No output limits in Man	Do not apply OUT HI LIM or OUT LO LIM when target and actual modes are Man. Lets the operator apply these limits.
PID Status Options	
IFS if BAD IN	Set Initiate *Fault State* status in the OUT parameter if the status of the IN parameter is BAD.
IFS if BAD CAS_IN	Set *Initiate Fault State* status in the OUT parameter if the status of the CAS IN parameter is BAD.
Uncertain as Good	If the status of the IN parameter is Uncertain, treat it as Good. Otherwise, treat it as BAD.
Target to Man if BAD IN	Set the target mode to Man if the status of the IN parameter is BAD. This latches a PID block into the Man state if the input ever goes bad.
No Select if Not Auto	Sets the target mode to next permitted mode if the target mode is CAS and the status of CAS IN falls to BAD.

Options

The *Options* tab (Figure 82) contains configurations of other settings including characterization, pressure range and units, bumpless transfer, display language, and temperature units.

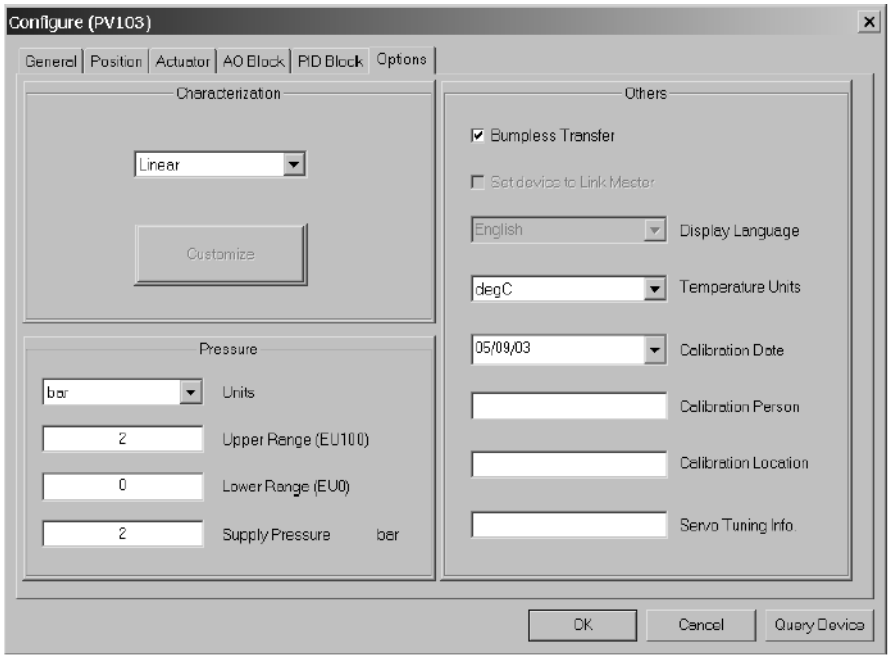

Figure 82 Options Tab-Configuration Dialog Box

Characterization Frame

The positioner is supplied with a choice of characteristics that modify the characteristic built into the plug and actuator. Choose a characteristic that works with the control valve's inherent characteristic to provide a desired overall installed characteristic. Avoid the common mistake of choosing an *Equal Percent* characteristic in the positioner if the valve has an *Equal Percent* characteristic built into the plug. Table 9 lists guidelines for configuring the valve characteristic. Use of a linear characteristic is recommended unless the process dynamics or control valve application calls for an alternate characteristic.

The FVP positioner provides typical characteristics of linear, equal percentage, and quick opening as well as a user-adjustable customer characterizer. Base the choice of positioner characteristics on overall particular loop characteristics.

Linear The valve position is proportional to the input to the FVP positioner.

Equal percent (50:1) Equal percentage with rangeability of 50 to 1. For equal increments of input, the valve position has equal percentage changes of current valve position. *Equal percent* characteristics are modified to close the valve at 0% input signal (Air to Open) or at 100% input signal (Air to Close). This is the default choice for an equal percentage characteristic.

Equal percent (30:1) Equal percentage with rangeability of 30 to 1. For equal increments of the input, the valve position has equal percentage changes of current valve position. *Equal percent* is the choice for an equal percentage characteristic when a slightly lower gain is needed at the upper portion of a range.

Quick open The quick opening characterization is the inverse of the *Equal percent(50:1)* characterization curve.

Camflex Percentage Selecting the Camflex option characterizes the valve as if it were a Masoneilan Camflex valve with settings of *Linear* and *Equal 50%*.

Define This activates the *Customize* button for a custom characterization, which defines the relationship between the input signal and the output position of the valve. Selecting this option displays an additional window where you can configure a characterization curve with ten adjustable segments. The curve has up to nine adjustable points and points in between are linearly interpolated.

Table 9 Characteristic Choice

Valve Type and Built-in Characteristic	Desired Installed Valve and Positioner Characteristic	Customary Positioner Characteristic	Non-Standard Characteristic-Not Recommended
Camflex	Linear	LINEAR	EQUAL30, EQUAL50, Quick opening
	Equal percentage	EQUAL50	EQUAL30, Quick opening
Varimax	Linear	LINEAR	EQUAL30, EQUAL50, Quick opening
	Equal percentage	EQUAL50-CAMFXEQ (use when replacing a 4700E)	EQUAL30, Quick opening
21000 series Model # 21X1X or 41000 series Model # 41X1X with LINEAR TRIM	Linear	LINEAR	EQUAL30, EQUAL50, Quick opening
	Equal percentage	EQUAL50	EQUAL30, Quick opening

Table 9 Characteristic Choice (Continued)

Valve Type and Built-in Characteristic	Desired Installed Valve and Positioner Characteristic	Customary Positioner Characteristic	Non-Standard Characteristic-Not Recommended
21000 series Model # 21X2X or 41000 series Model # 41X2X with EQUAL PERCENTAGE TRIM	Linear	Not recommended	Not recommended
	Equal percentage	LINEAR	EQUAL30, EQUAL50, Quick opening
Ball Valve with typical MODIFIED PERCENTAGE TRIM	Linear	Not recommended	Not recommended
	Equal percentage	LINEAR	EQUAL30, EQUAL50, Quick opening
Butterfly valve with typical MODIFIED PERCENTAGE TRIM	Linear	Not recommended	Not recommended
	Equal percentage	LINEAR	EQUAL30, EQUAL50, Quick opening
Reciprocating globe valve with LINEAR TRIM	Linear	LINEAR	Not recommended
	Equal percentage	EQUAL50	EQUAL30, Quick opening
Generic control valve with EQUAL PERCENTAGE TRIM	Linear	Not recommended	Not recommended
	Equal percentage	LINEAR	EQUAL30, EQUAL50, Quick opening

Custom Characterization Dialog Box

Use the *Characterization* dialog box (Figure 83) to define characterizations. There are nine definable points for the valve position at 10% increments of position *Set Point*. Use the mouse to drag the points on the curve or enter numerical values in the table to define the characterization.

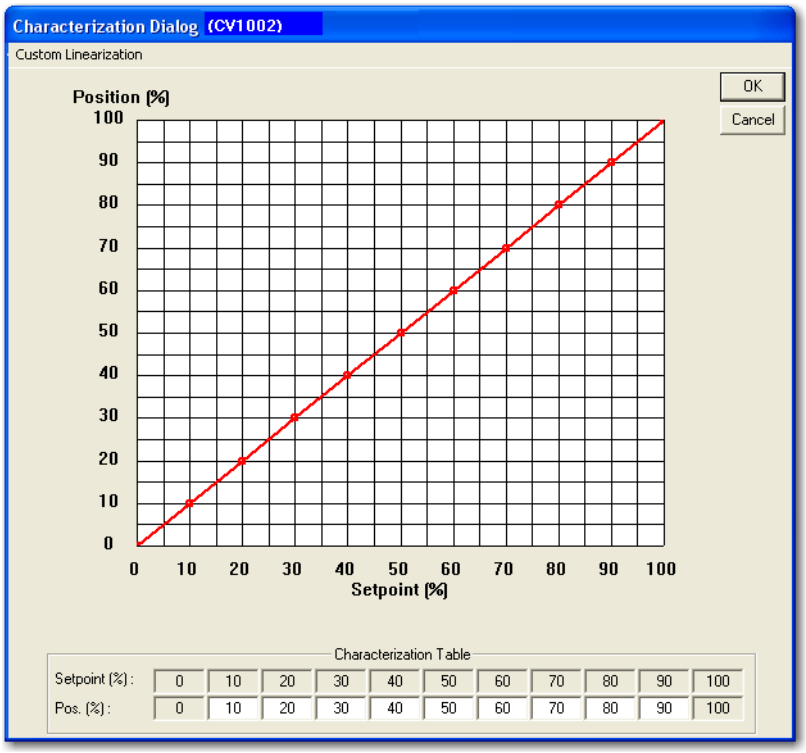

Figure 83 Custom Characterization Dialog Box

To configure a custom characteristic curve:

1. Enter the values in the edit boxes or mouse drag a point. The graph updates when the value is entered.
2. Click **OK** to accept the value and exit the *Custom Characterization* dialog box. ValVueFF checks the curve based on established rules. A warning appears if the curve does not meet the rules. The characteristic points are saved in FVP with a resolution of five digits.

   The unfinished curve in Figure 83 illustrates that the curve must be monotonic. Each point must be greater than the previous point.

   To smoothly blend a point between its adjacent points:

   ❑ Right-click the point.

   The curve in Figure 83 results in the display shown in Figure 84.

NOTE

When the characteristic is linear, the displays of PID output, position setpoint and target valve position all match. For all other (non-linear) characteristics the valve target position differs from the setpoint (Figure 84).

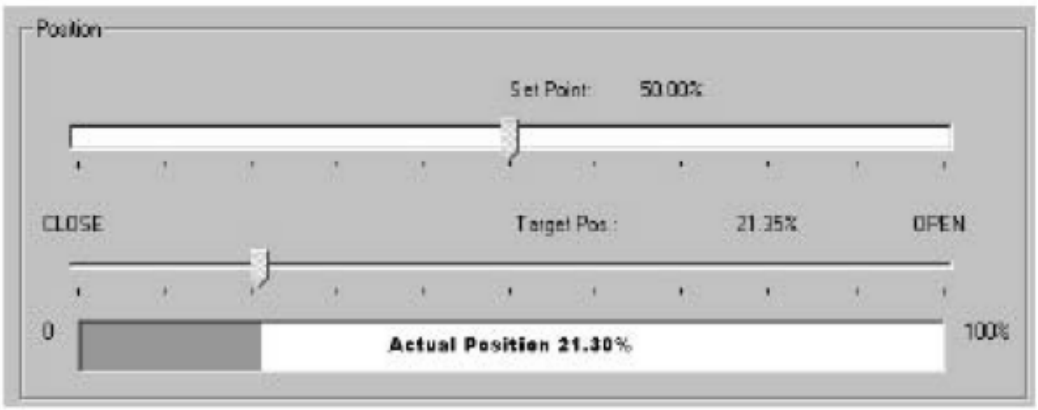

Figure 84 Display Showing Non-Linear Characteristic

Custom Linearization

Select the **Custom Linearization** menu item in the *Characterization* dialog box and the *Custom Linearization* dialog box appears (Figure 85).

When an FVP is mounted on a reciprocating valve, a small non-linearity in the valve position measured by the FVP position sensor versus actual valve position can result from the linkage configuration. This non-linearity can often be insignificant in a closed loop system and has the least effect on the closed loop performance.

Custom linearization cannot be used in combination with the equal percentage or quick opening characteristics. If a non-linearity correction and equal percentage or quick opening characteristics are both required, use the nonlinearity correction in the *Travel Calibration* dialog box and adjust the 50% point.

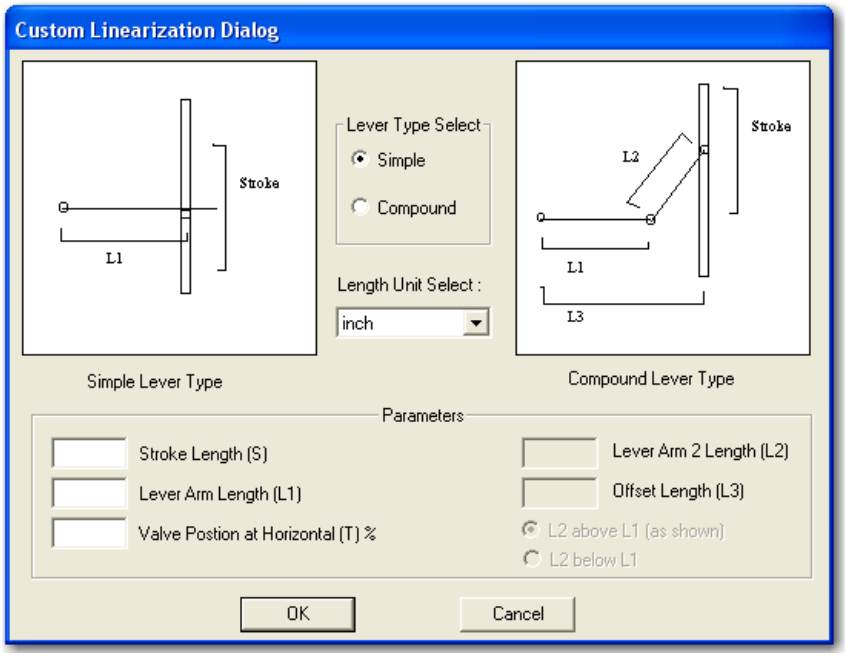

Figure 85 Custom Linearization Dialog Box

A custom linearization method built into ValVueFF can be used to correct this non-linearity. The method automatically generates a custom characterization that matches the specific linkage used.

CAUTION

Custom Linearization uses the same data as Custom Characterization. Only one of these configuration options can be used at one time. Custom Characterization data is discarded if Custom Linearization is used.

To configure this option:

1. Select **Define** from the *Options* tab *Characterization* pick list and click **Customize**.
2. Select **Custom Linearization** and the Custom Linearization window (Figure 85) appears.
3. Select **inch** or **mm** for *Length Unit Select*.
4. Select **Simple** or **Compound**:
   - ❑ *Simple* - The simple lever has the pivot point (the position sensor in the FVP) mounted a fixed distance (L1) from the valve stem pickup point.
   - ❑ *Compound* - The compound linkage has Lever L1 attached at one end to the pivot (the position sensor in the FVP) and at the other end to Link L2. Link L2 connects Lever L1 to the valve stem pickup point. Most linkages use a linkage with L3 equal to L1, the second lever arm is vertical when the first lever arm is horizontal. The correction computation correctly computes the correction curve when L3 is not equal to L1. However, L3 must be greater than 0, which requires that the valve stem pickup not be lined up with the pivot and that the pickup be on the same side of the pivot as the link between the first and seconds lever. A dialog box (Figure 86) displays the angle that the linkage moves. See Specifications for allowable angle segments.

Figure 86 Rotation Angle

Most linkages use the compound linkage system.

5. Enter data into:

- ❑ *Stroke Length (S)*
- ❑ *Valve Position at Horizontal (T)%*
- ❑ *Offset length (L3)* - the distance from the pivot to the valve stem pickup (L3). Compound only.
- ❑ *Lever Arm Length (L1)* - distance from the pivot to the valve stem pickup point.
- ❑ *Lever Arm 2 Length (L2)* - Compound only
- ❑ *L2 above L1 or L2 below L1 - Compound only*

6. Click **OK**.

Pressure Frame

Pressure Units	This is the unit code in TB.SPRING_RANGE parameter that affects output pressure unit code as well. It has no effect, however, in controlling function.
Upper Range (EU100)	This is the supply pressure in engineering units specified in the TB .SPRING_RANGE parameter. It is for information only and has no effect on control.
Lower Range (EU0)	This is EU100 of TB .SPRING_RANGE parameter for upper end engineering unit value.
Supply Pressure	This is EU0 of TB .SPRING_RANGE parameter for lower end engineering unit value.

Others Frame

Bumpless Transfer	When this option is selected, returning from manual to normal operation state is deferred until the current valve position and the position Set Point match. This is to assure the smooth valve position transition when switching the operation state to avoid a process disturbance. For most Foundation Fieldbus installations the initialization function built into the function blocks handles bumpless transfer. Leave the box unchecked unless there is a special requirement.
Display Language	This is the display language setting specific to the language locale. It is currently unused.
Temperature Units	° C or ° F. This is the temperature unit used in the device that has thermal settings.
Calibration Date	Last day this device was calibrated, enter automatically.
Calibration Person	ID of the technician performing the calibration.
Calibration Location	The factory, or other location, where calibration was performed.
Servo Tuning Info.	Displays whether the device was tuned manually or automatically.

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Calibration Services

8

Overview

Calibration Services provides tools to set valve stroke and tune the dynamic parameters for position control. Each set of tools is grouped on a tab in the *Calibration* dialog box.

Range Tab

To calibrate the position sensor to match the actual valve travel:

1. Use the *Auto Stop Limits* (“Auto Stop Limits” on page 106) or the *Manual Stop Limits* (“Manual Stop Limits” on page 107) function to search for the mechanical stop limits of the valve (Figure 87).
2. Use the *Open Stop Adjust* function (“Open Stop Adjustment” on page 108) to correct for over travel of the valve.
3. Check the calibration is done properly by:
   a. Moving the valve from the fully closed to the fully open position using the IVI in manual operating state.
   b. Make a record of the valve's *Actual Position* indication at each stop. It is also useful to record the *Actual Position* when the valve's mechanical position indicator reads 50%.

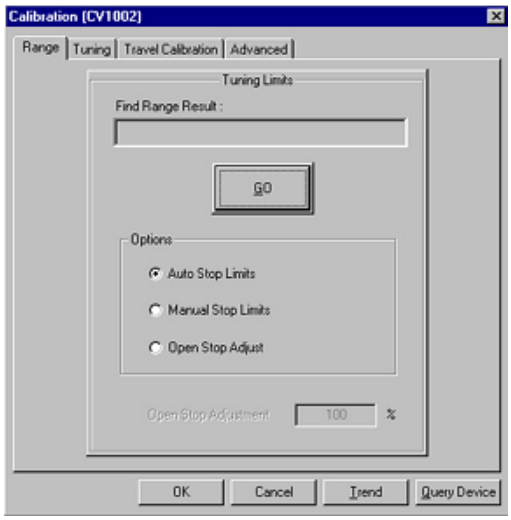

Figure 87 Calibration Dialog Box - Range Tab

Find Range Result

The *Find Range Result* field displays the result of the calibration execution:

1. Isolate the valve.
2. Select the **GO** button to run the selected calibration.
3. Select **Yes** when the *Stroke the Valve* message box appears. Results appear in the *Find Range Result* field.

Auto Stop Limits

WARNING *Range Calibration strokes the valve over its entire travel.*

When *Auto Stop Limits* is selected:

1. Isolate the valve.
2. Select the **GO** button.

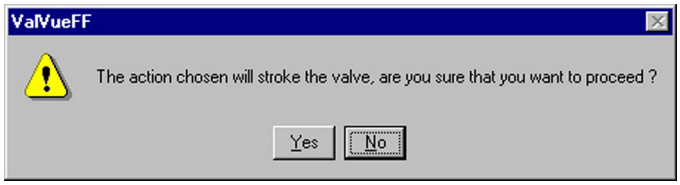

Figure 88 Stroke Valve Message Box

3. Click **Yes** to continue. The actuator is fully exhausted and then fully filled. The position at each stop is measured and saved. In some cases where the actuator size is extremely large the process can time out. In this situation *Use Manual Stop Limits* instead.

Manual Stop Limits

When *Manual Stop Limits* is selected:

1. Select the **GO** button. A progress dialog appears (Figure 89).

Figure 89 Progress Dialog Box

The actuator moves to one stop and waits for confirmation that the valve has completed its motion (Figure 90).

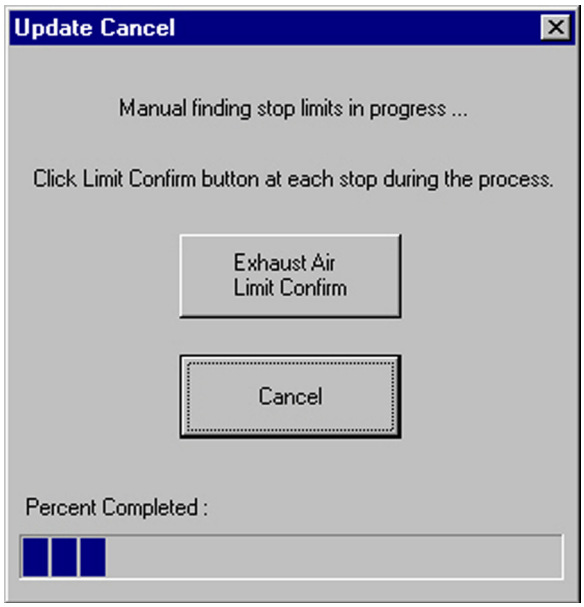
Update Cancel
Manual finding stop limits in progress ...
Click Limit Confirm button at each stop during the process.
Exhaust Air Limit Confirm
Cancel
Percent Completed :

Figure 90 Manual Stops Progress Bar

2. Press **Exhaust Air Limit Confirm** and the actuator moves to the second stop and wait for confirmation.
3. Press **Exhaust Air Limit Confirm** and the position at each stop is measured and saved.

Open Stop Adjustment

When a valve's open stop is a few percent more than the rated trave, correct it by:

1. Perform *Auto* or *Manual Stop Limits*.
2. Close the *Calibration* dialog box.
3. Change the mode to *Manual Operating*.
4. Move the valve until the mechanical stem travel indicator reads *100%* open. The positioner's *Actual Position* appears on the *Main* screen.
5. Open the *Calibration Range* dialog box.
6. Select **Open Stop Adjustment** to open the edit box.
7. Enter the noted position.
8. Select the **GO** button. The positioner exhausts air from the actuator and then fills it to determine the mechanical stop to stop travel. The positioner multiplies the stop-to-stop travel by the factor entered in the *Open Stop Adjustment* text box to establish the position that corresponds to 100% of the adjusted travel.

Tuning Tab

Use the *Tuning* dialog box to automatically tune the positioner's PID algorithm and examine the positioner servo parameters. The display provides two views for comparison, the left half displays the original set before performing Auto Tune, the right half is updated after Auto Tune. The parameters can be manually modified here as well. To see the description of the parameters, refer to the “Position Tab” on page 82. Auto Tune is successful for most valves. However, very large actuators, or high hysteresis can require manual tuning.

Always record existing tuning parameters and advanced tuning parameters before making changes or before running Auto Tune. Actuators that may require manual tuning include actuators with internal leaks, such as pistons and large actuators with high spring ranges. Look for a *Manual Tune Only* notice in the TB block tag descriptor.

WARNING

Before using Auto Tune, confirm that the valve is isolated from the process. This procedure exhausts the valve actuator to atmosphere and then fills the valve actuator to supply pressure and therefore strokes the valve over its full range. Keep clear of moving valve and actuator parts.

NOTE

Do not Auto Tune if manual tuning has been used as manual tuning values are overwritten.

Positioner Tuning Parameters

The position controller is a type of non-linear PID control algorithm with five standard parameters listed below. See Table 11 for the allowed and default parameter ranges. There are an additional eight advanced servo tuning parameters.

P (dimensionless) Proportional gain P is the ratio of change of output due to proportional control action to the change in position error. Common values for the positioner are 50 for small actuators and up to 5000 for large actuators. The larger the gain the faster the valve responds with increasing tendency to overshoot. If the gain is too low friction can cause limit cycles. Air supply pressure affects this value. The position controller must be re-tuned in case of air supply pressure changes. The default value of 120 is normally changed by Auto Tune.

I (seconds)	Integral time or reset time, is the time constant of integral control. Higher values of *I* cause less integral control action and increase loop stability. However, higher values of *I* increase the time to eliminate a steady- state position error. *0* turns off integral action and results in a steady-state position error. Sustained deviation can result in failsafe action if T2 is set. Therefore, *0* must be avoided for use in most applications. The default value of 15 seconds is normally changed by Auto Tune.
D (seconds)	Derivative time or rate time is the time constant of derivative control. Larger derivative time causes more derivative control action. *0* disables derivative action.
Derivative Gain (dimensionless)	Derivative gain controls the maximum response to rapid position change. The default value of *5* is normally adequate.
Dead Zone (%)	When the valve position is within its Set Point +/- the dead zone, no additional position control is performed. This value is normally 0%, however for high friction valves (e.g. valves with graphite packing) a higher dead zone helps avoid limit cycling due to the stick/slip action of the valve. In these cases the dead zone can be set at 0.1% to 5%

Auto Tune

To run Auto Tune.

WARNING *Observe all safety precautions.*

1. Isolate the valve from the process.
2. Select the **Auto Tune** button on the *Calibration* dialog box *Tuning* page. A message box warn that the valve will stroke.

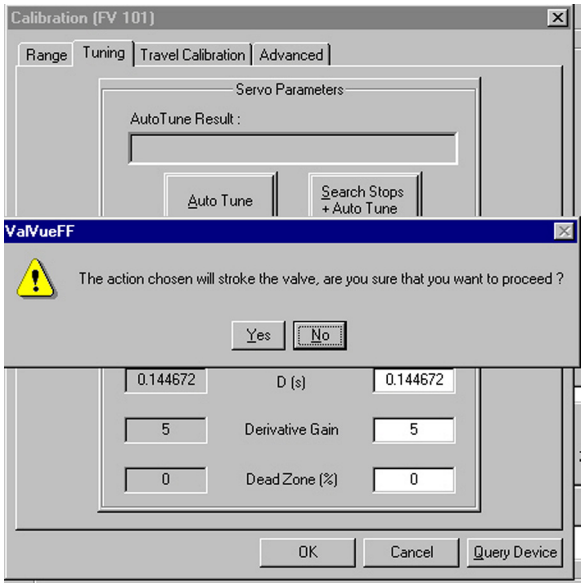

Figure 91 Auto Tune Warning Dialog Box

3. Select **Yes**. This procedure strokes the valve from stop to stop and then to tune for a few minutes. The *Progress* dialog box displays the time required (Figure 92). After tuning is complete a result appears in the *Auto Tune Result* text box.

Figure 92 Auto Tune Progress Dialog Box

Search Stops and Auto Tune In One Step

This procedure is a combination of *Auto Stop Limits*, *Find Stops* and *Auto Tuning*. You run two processes with a single click.

WARNING

Observe all safety precautions. During this process, the valve strokes the valve over its full range. Keep clear of moving valve and actuator parts.

1. Isolate the valve from the process.
2. Select **Search Stops + Auto Tune**. A message box appears stating that the valve strokes.
3. Select **Yes** to proceed. The *Progress* dialog box appears. This procedure strokes the valve from stop to stop and then tune for a few minutes. If you select **Cancel** the tuning stops and the parameters remain at their prior values.

Manual Parameter Adjustment

The parameters before tuning are shown on the left (Original). The parameters determined by Auto Tune are show on the right (Now). The new values (Now) become effective when you select **OK**. Select **Cancel** to return the original values. After Auto Tune is complete or as an alternative to Auto Tune, the parameters can be entered manually in the text boxes (Now).

Travel Calibration Tab

Use the *Travel Calibration* tab to adjust calibration at 0% and 100% to match the valve's working stroke when there is over-travel at one or both stops. Additionally, if the valve linkage introduces a non-linearity, it can be corrected by setting a correction at 50%. The corrections in this dialog box are applied over corrections applied with the *Open Stop Adjust* tool. Use only one set of correction tools for adjusting zero, span, and non-linearity calibrations.

NOTE

If manual tuning is performed write Manual Tune Only in the TB block tag descriptor.

Table 10 Servo Tuning Parameter Ranges

Parameter	Defaults	Range	Units
Proportional Gain	120	0.5 to 1300	Dimensionless
Integral Time	15	0 (disables); 2 to 50	Seconds

Table 10 Servo Tuning Parameter Ranges (Continued)

Parameter	Defaults	Range	Units
Derivative	.22 0	(disables); 0.05 to 1.0	Seconds
Derivative Gain	5	2 to 20	Dimensionless
Dead Zone	0	0 to 50	

Calibrating

1. Perform *Auto* or *Manual stops* procedures to clear previous calibration adjustments.
2. Select **0% Calibration** (Figure 93). Move the valve by:
   a. Entering a value in the *Target Pos* text box.
   b. Selecting **Set**, until the valve is in the desired closed position.
   c. Jogging the valve by selecting the *Increment change amount*, 0.1 for example, shown in Figure 93.
   d. Selecting the up or down arrow beside the *Change to %* text box.
   e. Selecting **Set**.
   f. Repeating until the valve is at the desired 0% position. It is not necessary to select **OK** when using the increment arrows.

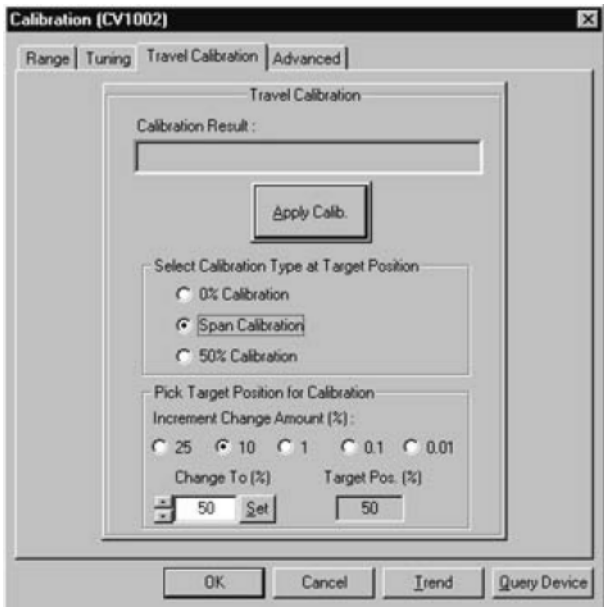

Figure 93 Increment the Closed Position - 0% Calibration

3. Refer to the mechanical travel indicator on the valve and select the **Apply Calib** button. A dialog box appears to confirm that you want to apply the calibration.

4. Select **Yes**.
5. Select **Span Calibration**.
6. Change the *Target Pos* value by:
   a. Entering a number or by incrementing until the valve is in the 100% open position, using the same procedure as in zeroing.
   b. Referring to the mechanical travel indicator on the valve and select the **Apply Calib**. A dialog box appears to confirm that you want to apply the calibration.
   c. Selecting **Yes**.
   d. Selecting **50% Calibration** to apply a correction for non-linearity.
   e. Moving the valve until it is at the mechanically indicated 50% position, using the same procedure as in zeroing.
   f. Referring to the mechanical travel indicator on the valve.
   g. Selecting the **Apply Calib** button. A dialog box appears to confirm that you want to apply the calibration.
   h. Selecting **Yes**. This provides non-linearity correction with two line segments (Figure 94), in which *60* is entered in the *Target Pos*. Be advised that 60% is an extreme example of correction.

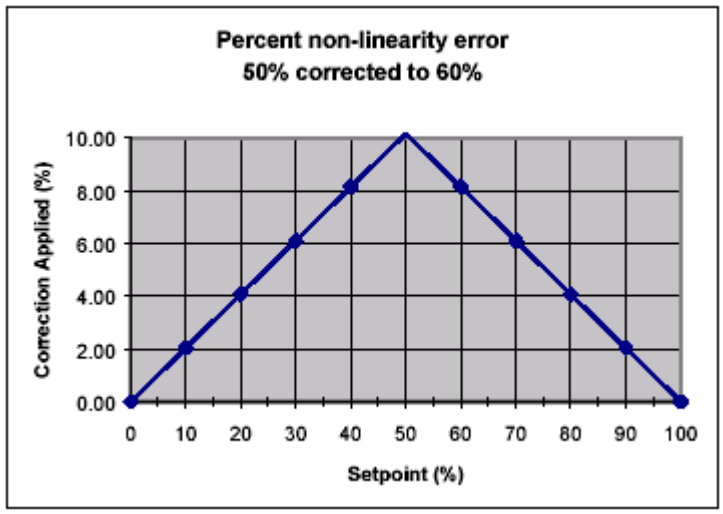

Figure 94 Non-linearity Travel Correction

CAUTION

Applying a correction to the 0% position calibration can alter the effect of other limits and settings. The Tight Shutoff Below parameter may need to be reconfigured. Applying a correction to the 100% span position calibration can alter the effect of other limits and settings. The Full Open Above parameter may need to be reconfigured.

Advanced Tab

Normally dynamic position control parameters are established by the Auto Tune procedure. Use this tab (Figure 95) for manually configuring Transducer Block (TB) dynamic position control parameters. *It is intended for technician use only.*

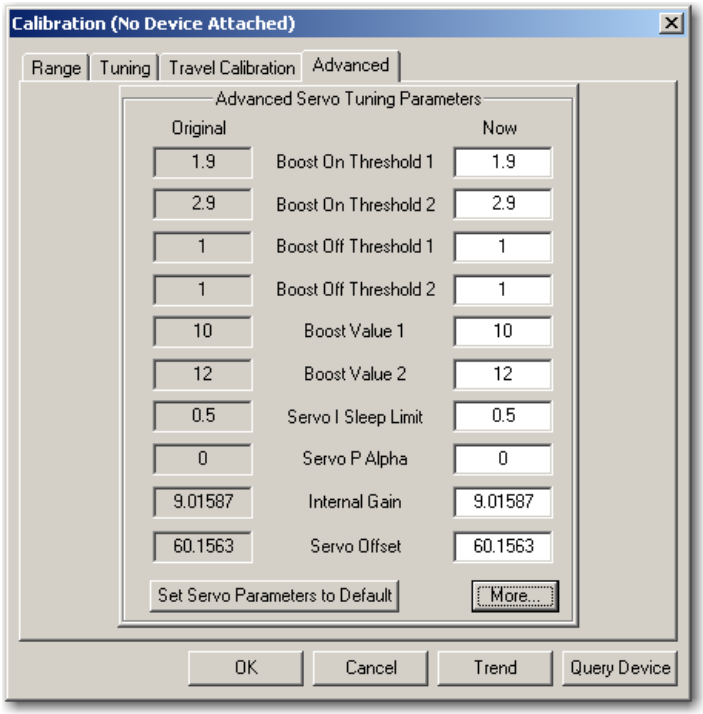

Figure 95 Calibration Dialog Box - Advanced Tab

Advanced Servo Tuning Buttons

Sets the parameters back to factory defaults.

Opens the Advanced (Double Acting) dialog to configure double acting parameters.

Advanced Servo Tuning Parameters

The *Advanced Servo Tuning Parameters* frame provides two views for comparison, the left half is the original one before changing the configuration, the right half is downloaded to the positioner and implemented after selecting **OK**.

CAUTION

Before performing Travel Calibration, check that the Tight Shut Off, Full Open Feature and Position Limits are disabled. If Travel Calibration is used to change zero and span more than 10 percent then the Position limits defaults may be incorrect. The position limits may need to be increased or deceased.

Table 11 Advanced Servo Tuning Parameters

Parameter	Description	Init Value	Range of Values	Units
Boost On Threshold 1	This position control parameter reduces the effect of deadband in control relay.	1.9	0 (disables); 0.1 to 10	%
Boost On Threshold 2	This position control parameter reduces the effect of deadband in control relay.	2.9	0 (disables); 0.1 to 10. (1)>= (2)	%
Boost Off Threshold 1	This position control parameter reduces the effect of deadband in control relay.	1	0 (disables); 0.1 to 10.	%
Boost Off Threshold 2	This position control parameter reduces the effect of deadband in control relay.	1	0 (disables); 0.1 to 10.	%
Boost Value 1	This position control parameter reduces the effect of deadband in control relay.	8	0 to 50	%
Boost Value 2	This position control parameter reduces the effect of deadband in control relay.	10	0 to 50	%
Servo I Sleep Lmt	This position control parameter prevents unnecessary overshoot for large step inputs.	0	0 to 10	Seconds
Servo P Alpha	This position control parameter adjusts the gain under very large hysteresis conditions.	0 (Off)	0 to 100	%

Table 11 Advanced Servo Tuning Parameters (Continued)

Parameter	Description	Init Value	Range of Values	Units
Internal Gain	This position control parameter shows the total gain for an I/P module, control relay, and valve.	5	0.5 to 50	rad. /mA
Servo Offset	Initial value of an integrator.	50	0 to 100	% of MV

Advanced (Double Acting) Tuning Parameters

The *Advanced (Double Acting)* tuning parameters dialog provides two views for comparison, the left half is the original one before changing the configuration, the right half is downloaded to the positioner and implemented after selecting **OK**. Refer to Table 11 for an explanation of parameters, which function the same as for single acting.

CAUTION

Before performing Travel Calibration, check that the Tight Shut Off, Full Open Feature and Position Limits are disabled. If Travel Calibration is used to change zero and span more than 10 percent then the Position limits defaults may be incorrect. The position limits may need to be increased or deceased.

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PID Block and Trending Services

9

Overview

The *PID Process Controller* dialog box (Figure 96) contains the tools for managing the PID function block. This dialog box, like the *IVI,* is composed of frames that group controls and displays. The *PID Status* frame displays and controls the PID states (modes), the *Setpoint* and *Process Variable*, and the Device tag name.

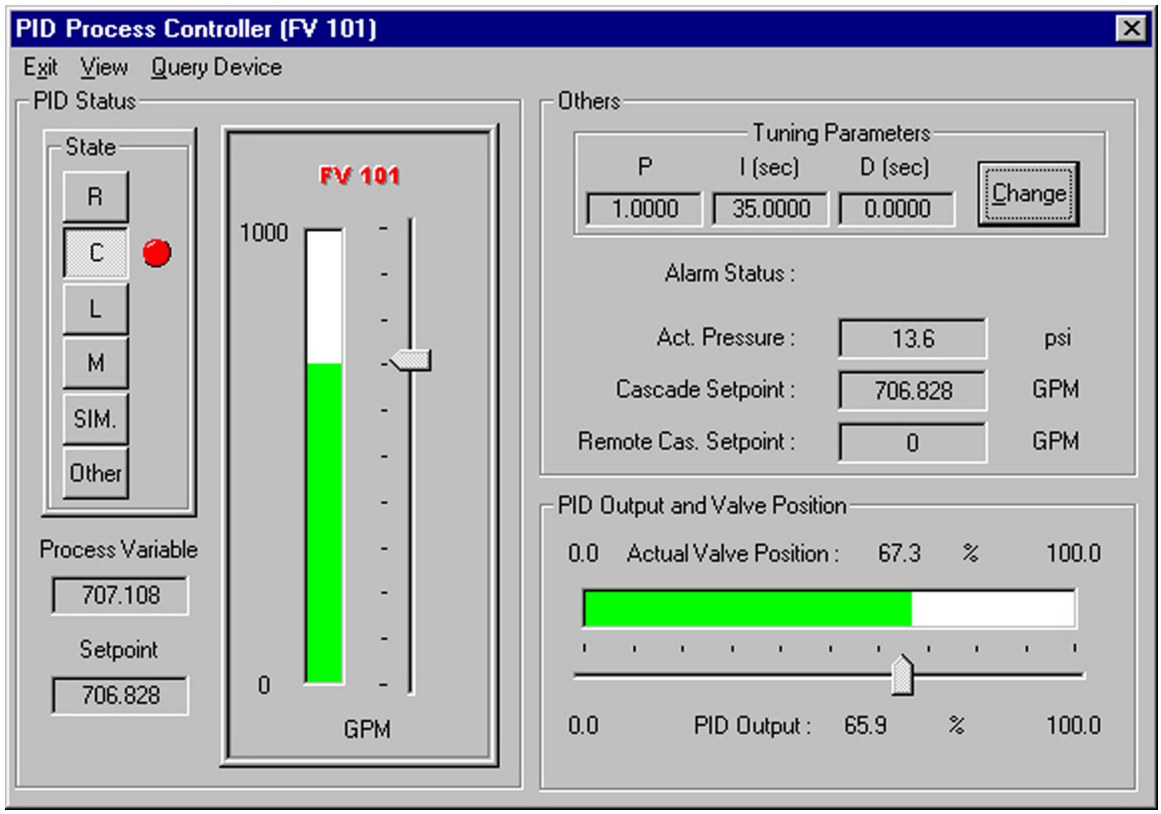

Figure 96 PID Process Controller Dialog Box

PID Status Frame

States and Modes

The permitted states of the PID block are grouped in the *State* frame:

RCAS — Select the **R** button. In this mode, the Set Point of the PID block is set by a remote application that writes to the RCAS_IN parameter regularly. This mode is allowed only if a remote application is *soft-wired* to the RCAS_IN parameter of the PID block.

CAS — Select the **C** button. In this mode, the Set Point of the PID block is set by a Foundation Fieldbus function block. This mode is allowed only if a Foundation Fieldbus function block OUT is *soft-wired* to the CAS_IN parameter of the PID block, and scheduled.

Auto — Select the **L** button. In this mode, the Set Point of the PID block is set by the Set Point slider or the Set Point text box.

Man — Select the **M** button. In this mode, the output of the PID is set by the output slider or the output text box. The PID algorithm in not processed in Man.

Simulate — Select the **SIM** Button. A ValVueFF user must have the permission level 8. Simulate allows a PID demonstration without a real process.

Other — Usually IMan or OOS is indicated by *Other* button. This button is an indicator only. It does not change the mode of the PID block.

CAUTION

Never use Simulate with a device connected to a live process. Simulate destroys any existing control linkages. After using Simulate, the function block links must be re-configured using a configuration tool.

Simulation Function

The simulation state is allowed only for training privilege level 8.

ValVueFF provides a special function for testing and training. You can connect the valve position to the input of the PID with lag of 5 seconds to allow demonstration of closed loop control.

CAUTION

Never use the simulation state if the valve is connected in a control loop or if the valve is controlling process flow. The Simulation State permanently removes important control loop information from the FVP valve positioner. The soft wired connection between the PID function block and the input function block must be restored after simulation is used. Reconfigure function block links after using simulate. The Clear Device command must be used when downloading a restored configuration.

In this state the control valve position readback signal is fed back into the PID input with a 5 seconds filter time. This forms a closed loop to simulate a process loop. The PID block is in AUTO mode. This is not the same as the Foundation Fieldbus SIMULATE parameter.

Others - Tuning Parameters

To adjust process tuning parameters:

CAUTION

Changing tuning parameters to incorrect values can result in dangerous process upsets. Only trained control experts should make these changes.

1. Select **Change** in the *Tuning Parameters* frame and Figure 97 appears.

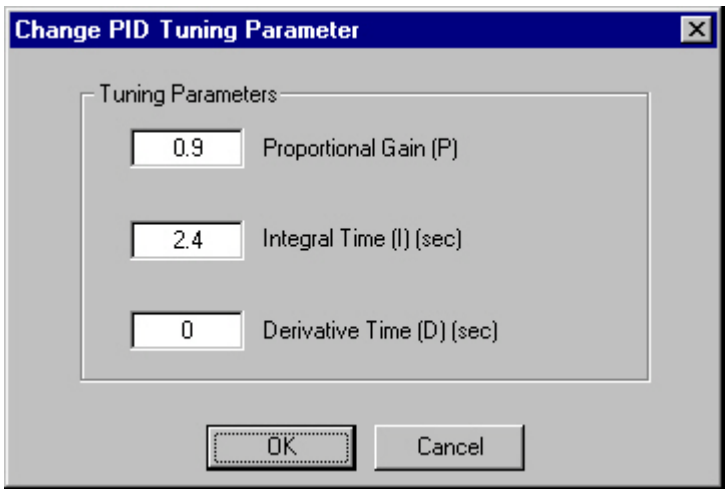

Figure 97 Change PID Tuning Parameters Dialog

2. Enter the *Proportional Gain*, *Integral Time*, and *Derivative Time* without changing control mode.
3. Select **View > Trend** to view the effect of tuning by:
   a. Selecting **View > Trend Selection**.
   b. Checking the boxes for **Process Variable**, **Process Set Point**, and **Target Pos**.
   c. Clicking **OK** and studying the trend.
   d. Selecting **File > Exit** when done.

PID Output and Valve Position

Use this frame (Figure 98) to adjust the *PID Output* and see its response against the valve position.

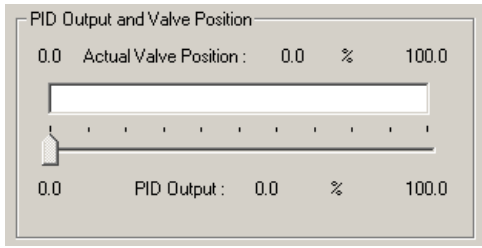

Figure 98 PID Output Slider

Trending Overview

The trend service can be used to observe the dynamic behavior of both the control valve and its associated process variable. It is particularly useful for tuning the PID process loop and can be used to alter the response of the positioner control algorithm after Auto Tune. Each device is provided with one trend window. ValVue supports up to 30 trend windows.

The *Trend* window displays selected historical data for up to 12 hours. The selected parameters can be actual valve position, target valve position, PID process variable and PID process Set Point. Select **Start** to start trending and select Stop to stop trend. While the trend is stopped the time axis continues to increase.

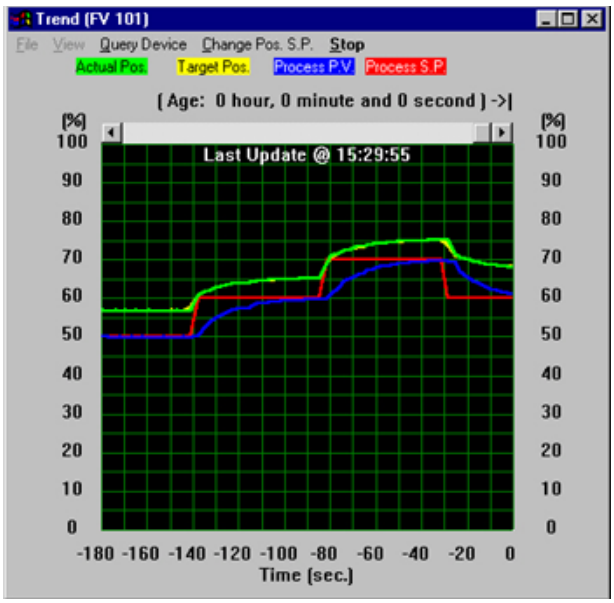
Trend (FV 101)
File View Query Device Change Pos. S.P. Stop
Actual Pos. Target Pos. Process P.V. Process S.P.
(Age: 0 hour, 0 minute and 0 second) ->|
Last Update @ 15:29:55
(%) 100 90 80 70 60 50 40 30 20 10 0
-180 -160 -140 -120 -100 -80 -60 -40 -20 0
Time (sec.)

Figure 99 Trend Screen with Pressure Loop

When trend is restarted, the time that it had been stopped appears as a blank.

Zooming

The vertical axis of the graph area can be zoomed by dragging a rectangle around the area of the interest. A right mouse click returns the display to full scale.

Customizing the Trend

Use the *View* menu to customize a trend:

1. Open the *Trend* window (Figure 99) either by:

   ❑ Right-clicking on a device in *Device Selection.*

   or

   ❑ Selecting **View > Trend** in the IVI or PID dialog boxes.

2. Select **View > Trend Selection** and Figure 100 appears.

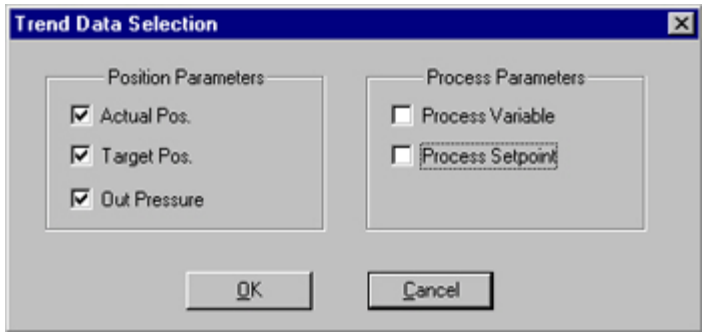

Figure 100 Trend Selection

3. Select parameters for trending and click OK.
4. Select **View > Scope Settings** and Figure 101 appears,

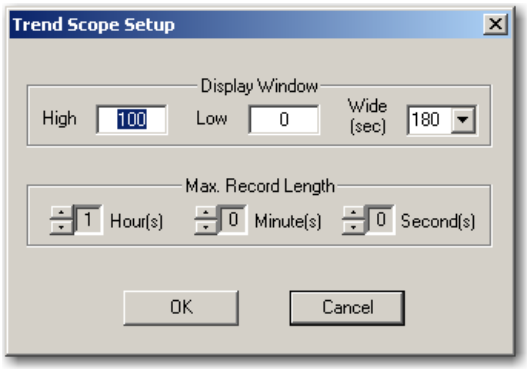

Figure 101 Trend Scope Setup

5. Set the duration of the trend, up to 12 hours.
6. Set the time scale to *45*, *90*, or *180* seconds using the Wide pull down and click **OK**.

7. Select **View > Sample Interval** and Figure 102 appears.

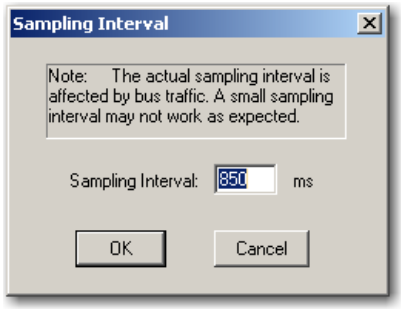
Sampling Interval
Note: The actual sampling interval is affected by bus traffic. A small sampling interval may not work as expected.
Sampling Interval: 850 ms
OK
Cancel

Figure 102 Sampling Interval

8. Set the interval and click **OK**.

NOTE

Decreases interval time increases the exactness of the trend, but this is also limited by device communication constraints and can lead to lost data points.

Viewing Valve Dynamic Responses

To observe the valve's dynamic response:

1. Place the positioner in *Manual*.
2. Select **Change Pos** from the menu bar.
3. Enter the desired value in the text box shown in Figure 103.

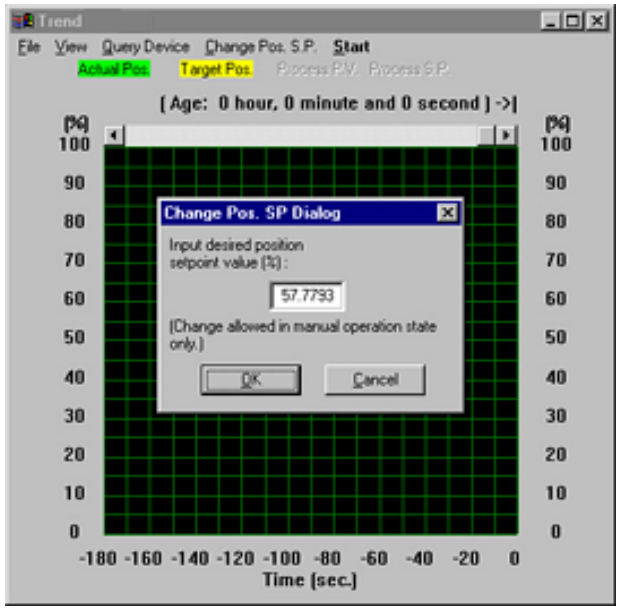

Figure 103 Change Set Point in Trend

Saving and Opening Trend Files

Use the *File* menu to save the trend data or load saved data for playback. For each device there is a trend window available. It is possible to open multiple trend windows for multiple positioner devices at the same time. The trend window can be run while other windows are active. Saving a trend does not discard current trend data but you must temporarily stop trending while performing the save.

To display a trend that has been saved:

1. Stop the current trend.
2. Save the trend if necessary (Figure 104).

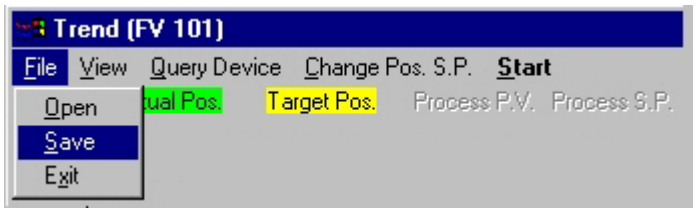

Figure 104 Saving a Trend

3. Select **File > Open**.
4. Select the desired trend from the *Open Trend* dialog box (Figure 105).

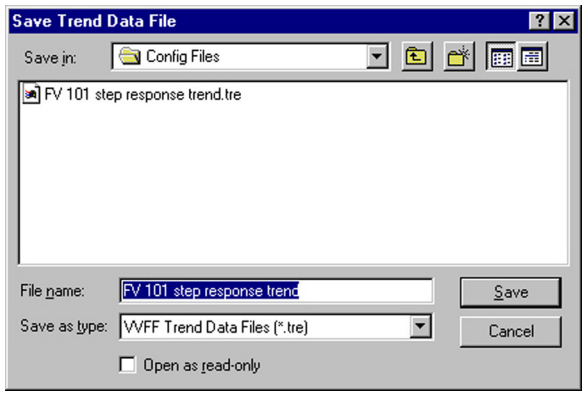

Figure 105 Select a Trend File Name

5. Select **Open**. A warning appears saying that all current trend data is lost.
6. Select **Yes** to proceed. or select **No** to go back and save the current data.
7. Select **File > Exit** to close the trend. All unsaved trend data is discarded.

Saving a Configuration

10

Overview

ValVueFF provides tools to retrieve, copy or save FVP configuration data that can be used for offline configuration. Use them to copy a configuration from a device to its replacement, or to configure a series of similar positioners.

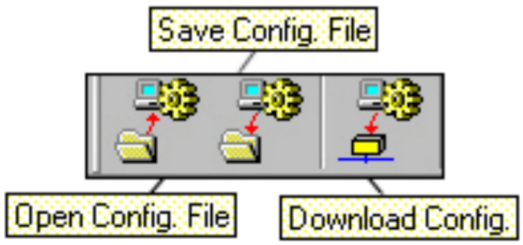

Figure 106 Configuration Toolbar Icons

Open File

This service is available only while running ValVueFF offline:

1. Either:
2. Select the **Open Config File** icon.

   or

   ❑ Select **File > Open File**.

   or

   ❑ Right-click the **Offline** icon in the *Device* tree and select **Open**.

3. Choose a .dmp file from the *Open Device Configuration File* dialog box (Figure 107).

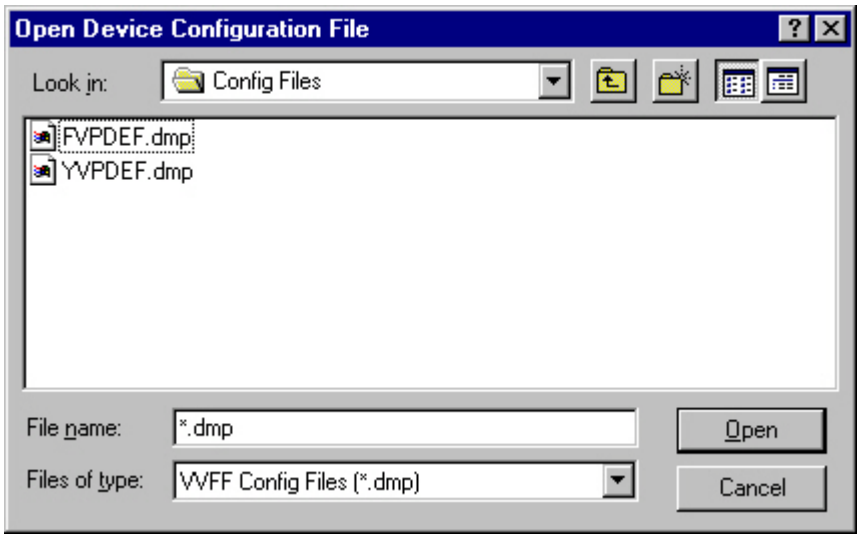

Figure 107 Open Configuration File Dialog Box

4. Select **Open**.

Save to File

This service is available either while online with a FVP or when offline. Use this procedure to save a configuration to a file.

1. Either:

   ❑ Select the **Save Config File** icon.

   or

   ❑ Select **File > Save File**.

   or

   ❑ Right-click the **Offline** icon in *Device* tree and click **Save**.

2. Navigate to the required directory in the *Save Device Configuration File* dialog box.
3. Select **Save**.

Downloading to the FVP

While a FVP is selected, configuration changes are downloaded to the device as the changes are made when you select **OK** in the configuration dialog box. Use this procedure to download a configuration from a file.

Download Select Dialog
Device Selection for download target
FV 101
NOTE: Downloading will put the device into the out of service state.
OK
Cancel

Figure 108 Download Select Dialog Box

WARNING

Do not download a configuration to a positioner if the valve is controlling a process. Always isolate the valve from the process before a download. Test the configuration before reconnecting the valve.

1. Put ValVueFF in the OFFLINE state.
2. Either:

   ❑ Select the **Open File** icon (Figure 106).

   or

   ❑ Select the **Download** icon.

   or

   ❑ Right-click the **Offline** icon in the *Device* tree and select **Download**.

3. Select a device as a target from the list box (Figure 108) and select **OK** to confirm the selection. Downloading puts the device into the *Out of Service* operation state. You are prompted for permission (Figure 109).

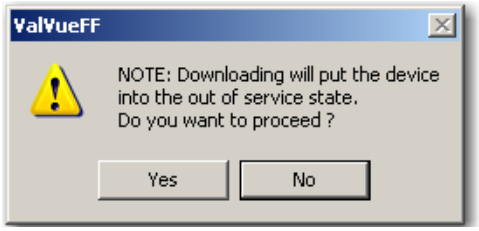

Figure 109 Download Confirm Process

4. Select **Yes**. The download starts and lasts approximately one minute. The first parameters to download are tagname and node address. You are asked to confirm that it acceptable to change the tag or address.
5. Select **Yes**.

   If the device tag in not unique Figure 110 appears. Click **OK** and follow the dialog instructions to fix the situation.

ValVueFF
NOTE: The device tag is either empty or non-unique.
Right click the device to select Tag/Address menu for changing or initialization before open the device.
OK

Figure 110 Device Tag is Not Unique

WARNING

Never change tag or address of a positioner unless the valve is isolated from the process.

CAUTION

Changing tag or address can alter or destroy control linkages between function blocks. After changing these parameters the control configuration must be tested and corrected.

Download Firmware

Use this to upgrade firmware to the field device via Foundation Fieldbus. Typical uses are to add new features such as function block and diagnostics to existing devices, and to optimize existing plant field devices.

This feature is applied only to F/YVP110 Type 7 device that has Flash memory installed. F/YVP110 Type 1 device (including both dev rev 2 and 3) does not support firmware download feature.

To download firmware:

1. Select **Tools > Download Firmware** (.ffd file). A dialog appears.
2. Navigate to and select the file.
3. Select **Open** to download firmware and (Figure 111).

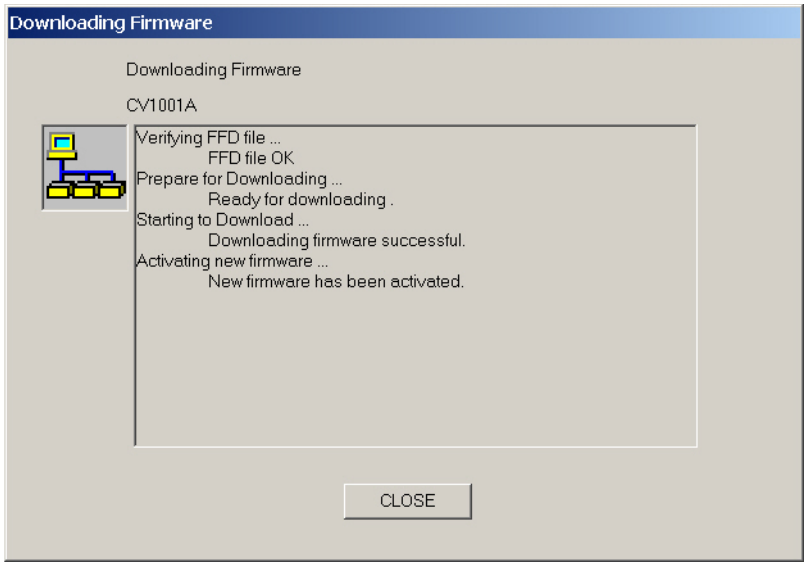

Figure 111 Downloading Firmware

A message dialog appears after firmware is downloaded (Figure 112).

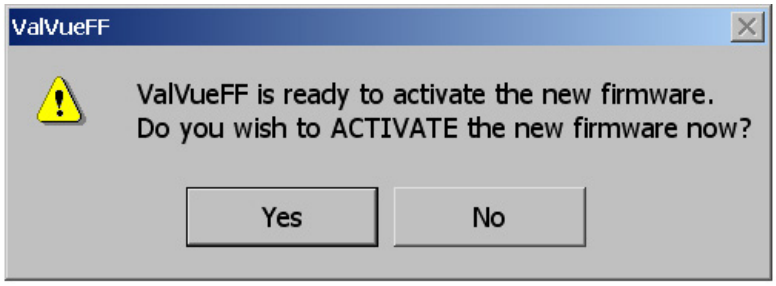

Figure 112 Activate Firmware Dialog

4. Click **Yes** to activate the firmware.

This activation process temporarily halts fieldbus communication and function block executions. The software reports that the downloaded device is not responsive. To continue to operate to this device with ValVueFF, you need to select this device again.

If you select **No**, you can activate the new firmware by clicking **Tools > Activate Firmware**.

Copying a Configuration to a New Positioner

To copy a configuration from a positioner to another positioner without file saving:

1. Disconnect the source device from the fieldbus segment to prevent altering it's configuration.
2. Select a source device. Wait until ValVueFF completes reading the configuration from the device.
3. Select the *Offline* icon but do not open a *.dmp* file. The configuration of the previously selected device remains open in ValVueFF.
4. Open *Configuration Services* while in *Offline* state.
5. Enter the correct *Tag* and *Node Address*.
6. Either:

   ❑ Right-click on **Offline**.

   or

   ❑ Select the **Download** icon to open the *Download Selection* dialog box shown in Figure 108. A dialog appears (Figure 113).

Current Tag/Address before download: DEVICE-5945430001J0000061 / 0xf4
Attempting new Tag/Address : FV 101 / 0xf7
Are you sure that you want to use the new tag/address and download all other configuration data ?
Yes
No

Figure 113 Confirm Tag or Address Change

7. Click **Yes** to proceed and Figure 114 appears.

CAUTION

After the download is complete, the device must remain powered for at least 60 seconds to transfer the data to permanent memory.

Downloading a configuration overwrites all device configuration data.

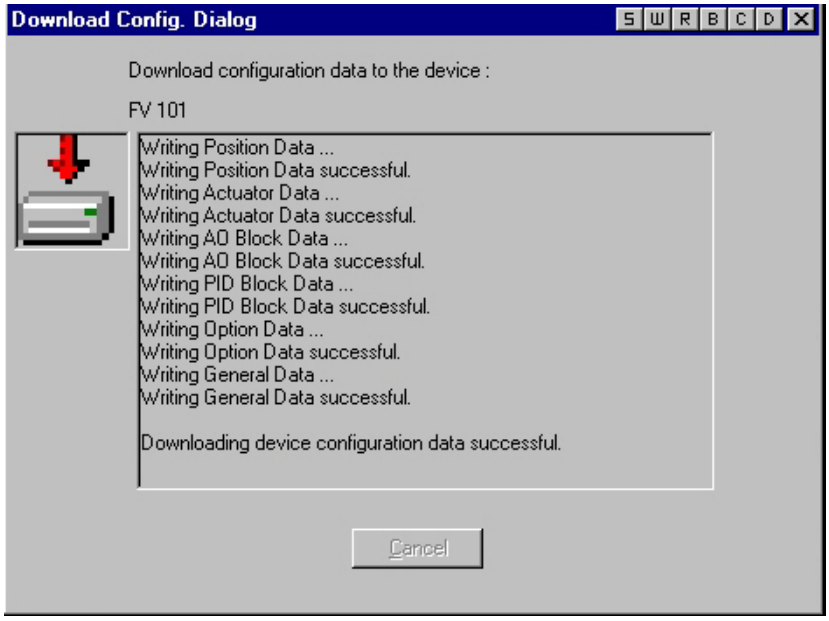
Download Config. Dialog
S W R B C D
Download configuration data to the device :
FV 101
Writing Position Data ...
Writing Position Data successful.
Writing Actuator Data ...
Writing Actuator Data successful.
Writing AO Block Data ...
Writing AO Block Data successful.
Writing PID Block Data ...
Writing PID Block Data successful.
Writing Option Data ...
Writing Option Data successful.
Writing General Data ...
Writing General Data successful.
Downloading device configuration data successful.
Cancel

Figure 114 Configuration Download Progress

8. After configuration it is necessary to create the control function block linkages in a third party Foundation Fieldbus control configure.

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Diagnostic Services

11

General

The *General* tab (Figure 115) on the *Diagnostics* page displays the service history for continuous data. The continuous data is compared with the limits set in the *Actuator* setup. See “Actuator Page” on page 87 for a detailed description.

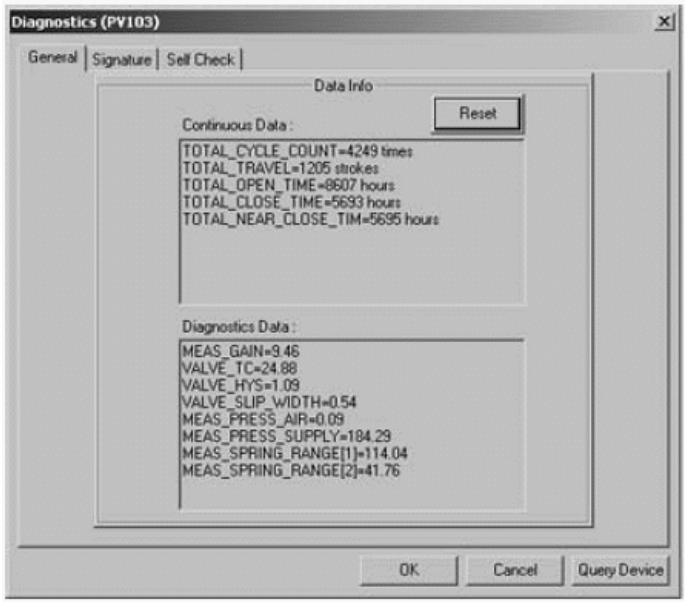

Figure 115 General Tab - Diagnostic Dialog Box

To reset the continuous data to zero:

1. Make a record of the current values.
2. Click **Reset**. All continuous data is lost and cannot be recovered.

Self Check

The *Self Check* tab (Figure 116) on the *Diagnostics* page tests the performance parameters used to determine the position control parameters. The test runs Auto Tune but does not change any parameters. The parameters display provides two views for comparison:

- ❑ The left half is the original data before performing this test.
- ❑ The right half displays the result of the Self Check test.

WARNING

Performing self check strokes the valve. Do not perform self check when the valve is in controlling the process. Keep clear of moving of moving valve parts.

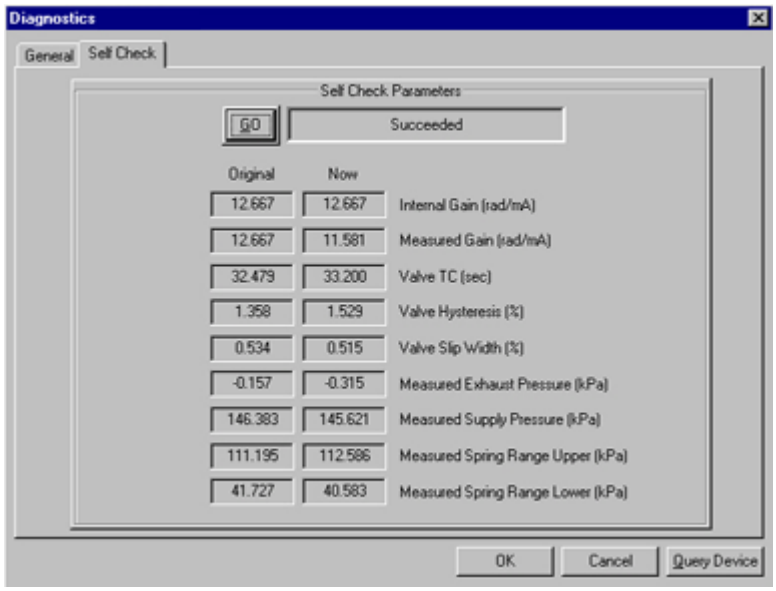

Figure 116 Self Check Dialog Box

Performing a Self Test

To perform a self diagnostic test:

1. Select **Tools > Diagnostics**. The *Diagnostics* dialog box appears.
2. Select the **Self** tab.
3. Select **GO** to start the test. The results of the self check appear in the box next to the *GO* button.
4. Note any error messages.

Self Test Explanation

Internal Gain	This describes the forward gain of control valve system. The forward gain is the gain of the I/P, control relay, valve actuator (Spring range), and linkage combined. The unit for this parameter is rad/mA. (The input signal of I/P is mA, the output signal of linkage is rad). The *Internal Gain* is based upon the *Measured Gain*.
Measured Gain	This is measured by the Auto Tune function (units: mA/rad).
Valve TC	This describes how fast the control relay can drive the air actuator (units: seconds). This parameter is measured by the Auto Tune function.
Valve Hysteresis	This describes the hysteresis of the control valve (units: %). This parameter is measured by the Auto Tune function.
Valve Slip Width	This describes the slip width of control valve (units: %). The stem of the control valve makes an abrupt movement when the pneumatic actuator breaks the friction of the valve packing. Slip width is the value of abrupt movement of the stem.
Measured Exhaust Pressure	This describes air pressure. This parameter is available only in the AP option (with pressure sensor). The units are determined by unit index of *Spring Range*. This parameter is measured by the Auto Tune function. It is the value of actuator pressure when the valve is at the 0% mechanical stop. The parameter is used for diagnostics only; not for tuning or control.
Measured Supply Pressure	This describes supply pressure. The units for this parameter are determined by unit index of Spring Range. This parameter is available only in the AP option. This parameter is measured by the Auto Tune function. It is the value of actuator pressure when the valve is at the 100% mechanical stop. The parameter is used for diagnostic only; not for tuning or control.
Measured Spring Range - Upper	This describes upper range value of the control valve spring range. The units for this parameter are determined by unit index of *Spring Range*. This parameter is available only in the AP option. This parameter is measured by the Auto Tune function. The parameter is used for diagnostics only; not for tuning or control.
Measured Spring Range - Lower	This parameter is the lower range value of the control valve spring range. The units for this parameter are determined by unit index of *Spring Range*. This parameter is available only in the AP option. This parameter is measured by the Auto Tune function. This parameter is used for diagnostics only; not for tuning or control.

Signature Tab

The *Signature* function is a component of the diagnostic function (Figure 117). This function protects the valve from degradation failure and reports on the condition of the control valve or the positioner by comparing the history of signature characterization. To accomplish this objective a positioner must have the ability to measure and retain data describing the characteristics of the control valve and the positioner.

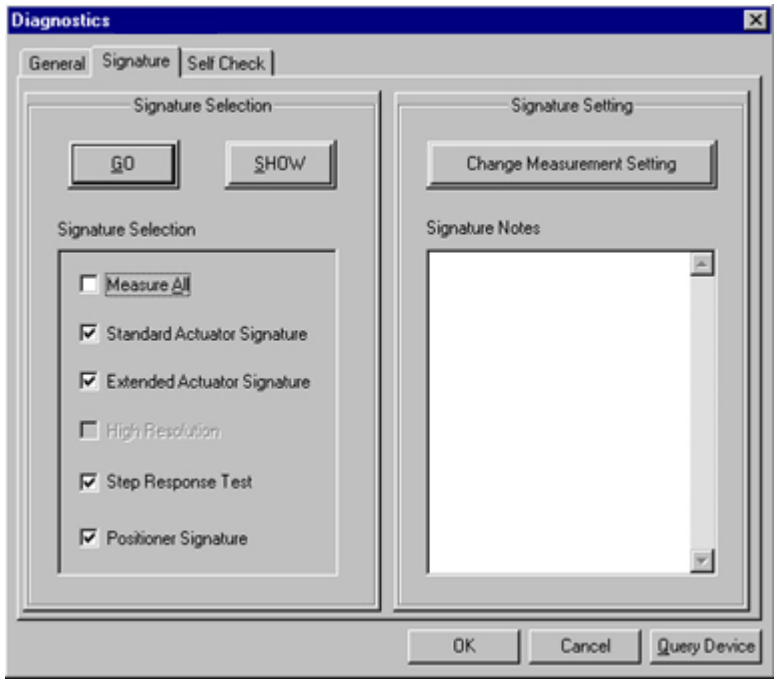

Figure 117 Signature Tab - Diagnostic Dialog Box

Measurement procedures for signature of the control valve and the positioner force the control valve to move the stem position; thus the measurement procedures must be performed while the process is off line and the device is in Out of Service state.

ValVueFF used with the /BP (pressure) option has the ability to store locally, the standard actuator signature data. When connected to ValVueFF, using the *Diagnostics* window, the valve signatures can be retrieved from ValVueFF non-volatile memory and compared to the current valve position, output pressure and other process information with valve signatures to determine if there is a change in system performance.

The ValVueFF with /BP option supports six types of user signature functions:

- *Measure All*: Measures all of the other five.
- “Standard Actuator Signature” on page 149: Static characteristic of the control valve.
- *Extended Actuator Signature*: Extended static characteristic of the control valve.

- ❑ *High Resolution Actuator Signature*: High resolution static characteristic of the control valve.
- ❑ *Step Response Test*: Step response characteristic of the control valve system.
- ❑ *Positioner Signature*: Static characteristic of the control valve system

Signature Selection Frame

You can select **Measure All** or any combination of signatures set in either execution or data display (Figure 118). When selecting *Measure All*, FVP performs signature measurement in the following order:

1. *Actuator Signature*
2. *Extended Actuator Signature*
3. *Step Response Test (single step)*
4. *Positioner Signature*

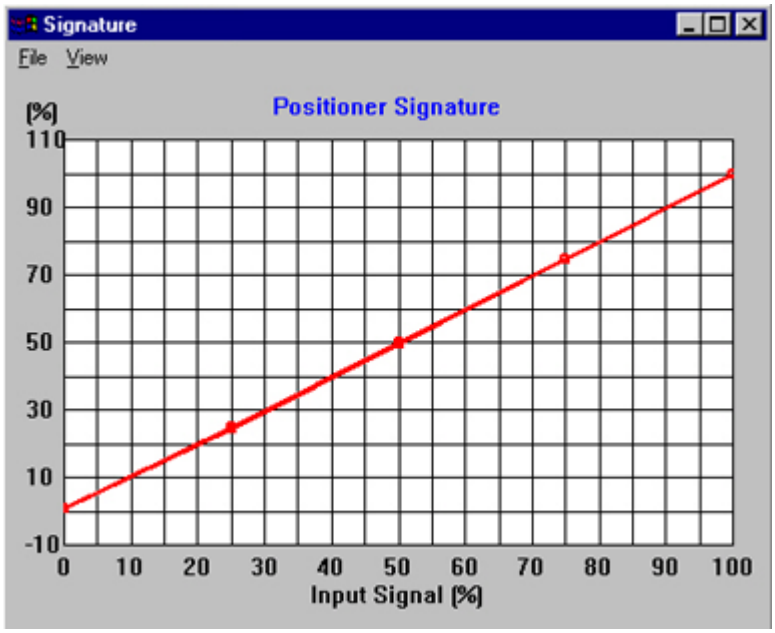

Figure 118 Positioner SIgnature Graph

Measure All does not support *High Resolution* and only support *Single Step Response Test*. For non-Measure All selection (any combination of signatures set), FVP can execute more than one command. It supports *Multiple Step Response Test* and Hi*gh Resolution Actuator Signature*:

- ❑ Selecting **Go** (Figure 119) starts the measuring signature. Refer to Signature Measurement for details.

- ❑ Selecting **Show** displays the signature result. Refer to “Signature Graphs” on page 142 for details.
- ❑ Selecting **Change Measurement Setting** opens *Signature Measurement Setting* dialog box to modify the selected signatures measurement condition (setting parameters).
- ❑ Use *Signature Notes* for entering notes. This information automatically attaches to the signature data after selected signatures measurement are performed.

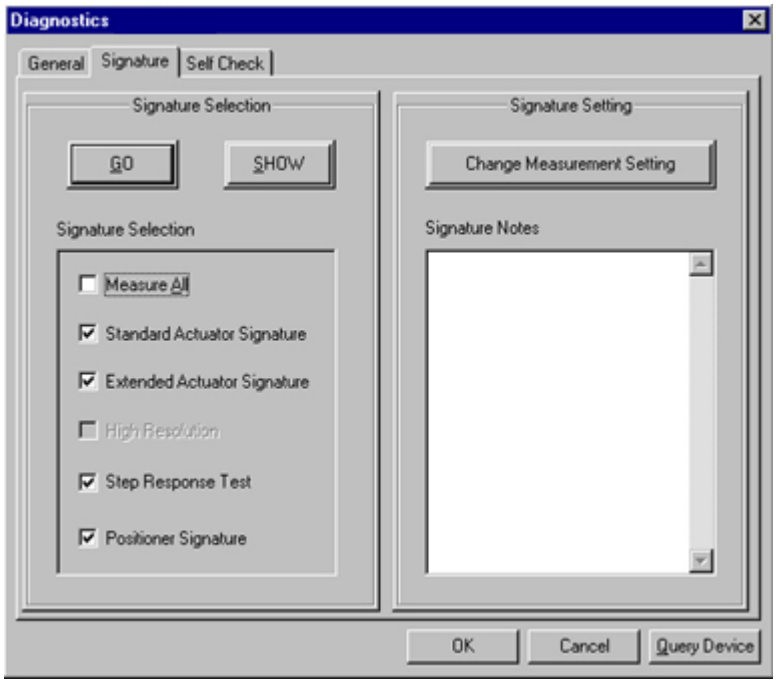

Figure 119 Selecting Signatures Dialog Box

Signature Measurement

Click **GO** and the signature procedure commences, the current measuring signature, measurement setting, real time data, real time curves, status and progress are displayed (Figure 120).

Parameters include:

Window Title	Current execution signature type.
Measurement Setting	Measurement condition of the signature in progress or other messages before signature starts.
Temp	Temperature, the value of TB parameter ELECT_TEMP
Position	Value of the feedback signal of FVP110, FINAL_POSITION_VALUE.VALUE
Pressure	Value of output pressure of FVP110, MEAS_PRE_AIR

AO Output	Value of input signal of FVP110. AO block OUT.VALUE
Actual Position (red)	Curve of feedback signal of FVP 110, FINAL_POSITION_VALUE.VALUE
Air Pressure (yellow)	The curve of output pressure of FVP110, MEAS_PRE_AIR
AO Output (blue)	The curve of input signal of FVP110. AO block OUT.VALUE
Current Status	Indicates current operation, or the measurement result.
Progress Bar	Current progress of the signature measurement.
Cancel Current Signature	Selecting this button cancels the current executing signature and measures the next signature. For *Measure All*, it terminates all the signatures.
Cancel All Signature	Selecting this button cancels all the selected signatures.
Zoom In/Zoom Out	In the curve displaying area, you can select a rectangle area to zoom and double click mouse to restore.

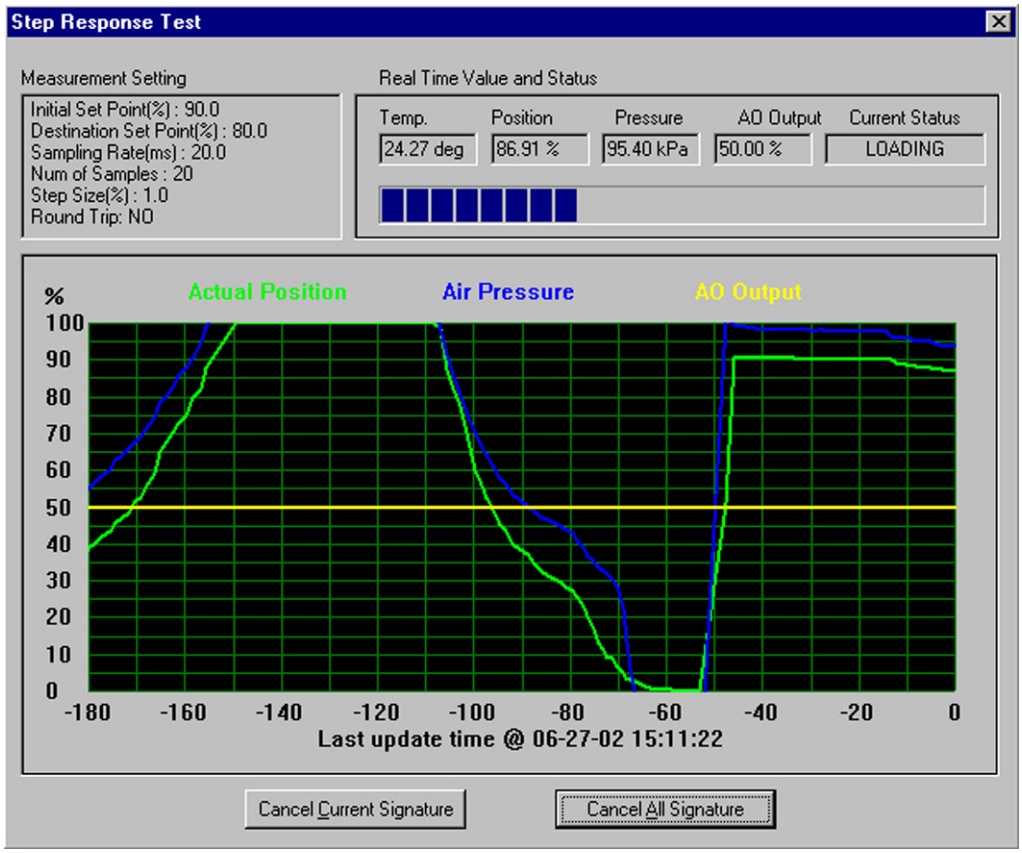

Figure 120 Signature Measurement

Signature Graphs

After signature measurement completes, the signature graphs dialog box appears. Based on the your selection, the signature graphs displays up to four types of signature graphs (Figure 121). Because extended actuator signature and high resolution actuator share a database, their graphs appear in the same graph window.

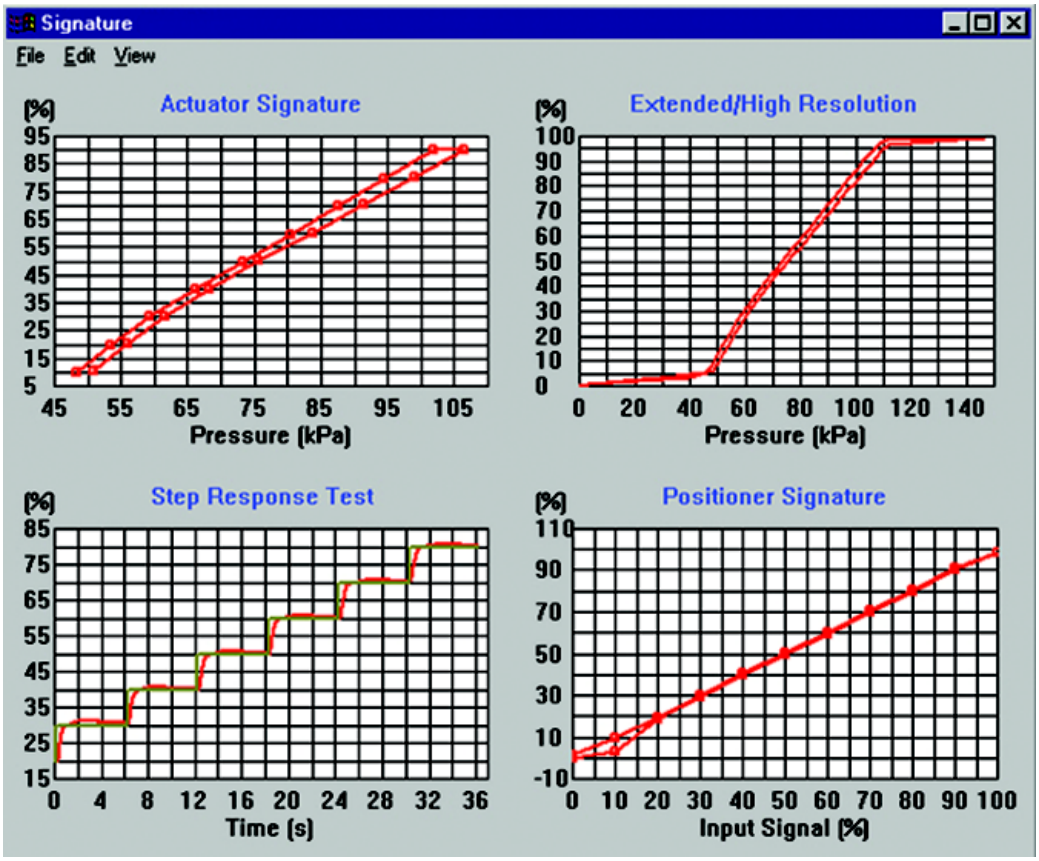

Figure 121 Signature Graphs

Even when current selected device is OFFLINE or for an FVP whose device revision is 2, the application can show graphs which are stored in PC. At the *Signature Selection* screen:

1. Make checkbox selections.
2. Select **Show**. The graph window opens.

To edit a signature graph:

1. Select **Edit** on the menu bar.
2. Select a signature graph type to be edited.

A pop-up menu displays in the center of selected graph area (Figure 122). Or move the cursor to the area of signature graph to be edited and make a right click of the mouse. A pop-up menu used for editing operations displays.

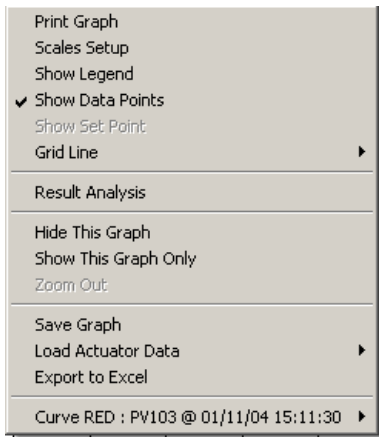

Figure 122 Signature Graphs Right Click Menu

Items on this menu depend on whether you click a graph or an individual curve:

Hide Graph/Show Graph

Selecting **Hide this Graph** from a pop-up menu or unchecking related menu item from *View* menu hides specified graph from a window. To show this graph again, check related menu item from *View* menu.

Show This Graph Only/Show All Selected Graph

Show This Graph Only enlarges the graph in a full window and hides other graphs. Show All Selected Graph restores the full window graph to its previous size and shows other selected graphs again.

Graph Scale Setup

Double-clicking the X-Axis or Y-Axis area of a graph or selecting **Scales Setup** from a pop-up menu opens Graph Scale Setup dialog box. Refer to “Graph Scale Setup” on page 146 for details.

Graph Legend

Selecting **Show Legend** from a pop-up menu shows the legend that includes the data source and its measurement time stamp. The legend box is movable. By selecting one of the items listed in the legend box shows the summary information of the measurement.

Show Data Points

By checking/unchecking **Show Data Points** from a pop-up menu, graph window shows the signature curve with/without data dots. In default mode, Actuator Signature and Positioner Signature graph show with dots, Extended Signature/High Resolution and Step Response Test show without dots.

Show Set Points	For *Step Response Test* only. Checking/Unchecking **Show Set Point** from a pop-up menu displays or hides the set points curve in step response graph. The default mode shows the set points curve.
Zoom In/Zoom Out	*Zoom In*: In the curve area of a graph window, a selected rectangle area by mouse zooms in. *Zoom Out*: double-clicking or select **Zoom Out** from pop-up menu restores current displaying scale setting to default.
Signature Summary	Selecting a curve and selecting **Measurement Summary** from the pop-up menu opens *Signature Summary*, Dialog box to show signature measurement information. Refer to "Signature Summary" on page 146 for details.
Signature Notes	Selecting a curve and selecting **Signature Notes** from the pop-up menu displays *User Notes*. This information is editable. Refer to "Signature Notes" on page 147 for details.
Remove Curve	Selecting a curve and selecting **Remove Curve** from pop-up menu deletes the curve from the graph.

Load Signature Graphs

To load a group of graphs:

1. Select **File > Load**.
2. Select a signature file and click **Open**. If the current graph window is not empty, you are prompted to clear out the old graph (Figure 123).

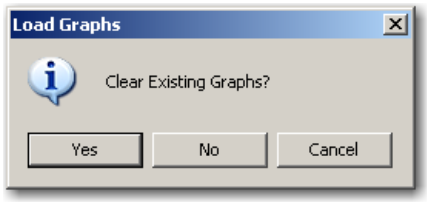

Figure 123 Clear Existing Graphs

By loading data into an existing graph, you can compare curves.

To load a specific type of graph:

1. Move the cursor to the graph, right-click, select **Load Data** from the pop-up menu.
2. Select the data to be loaded:
   - ❑ **Current**
   - ❑ **File -** select the *.std* file and click **Open.**
   - ❑ **Record**
   - ❑ **Baseline**

Saving Signature Graphs

To save a group of graphs:

❑ Select **File > Save.**

To save a specific graph:

1. Move the mouse cursor to the graph.
2. Right-click and select **Save Graph**. The file name for a group has an underscore before the name.
3. Navigate to the proper directory and click **Save**.

To save data of current data base in FVP to a file:

1. Select the curve from a pop-up menu.
2. Select **Export to Excel**.

If signature type is standard actuator signature:

1. Select **Save to Record**.
2. Select **Save to Baseline.**

Printing Signature Graphs

To print a group of graphs:

❑ Select **File > Print All**.

To print one specified graph:

❑ Right-click and select **Print Graph**.

Export Signature Data

Signature data can be exported to Excel or Notepad. If Excel system is not installed, data is exported to Notepad.

To export all data in one graph window:

❑ Select **Export to Excel** from a pop-up menu.

To export one signature measurement data in one graph window:

❑ Select a curve to export from a pop-up menu, then select **Export to Excel**.

Graph Scale Setup

Use this (Figure 124) to setup signature graph windows display area. *X-Axis*: Display range of input parameter. *Y-Axis*: Display range of output parameter.

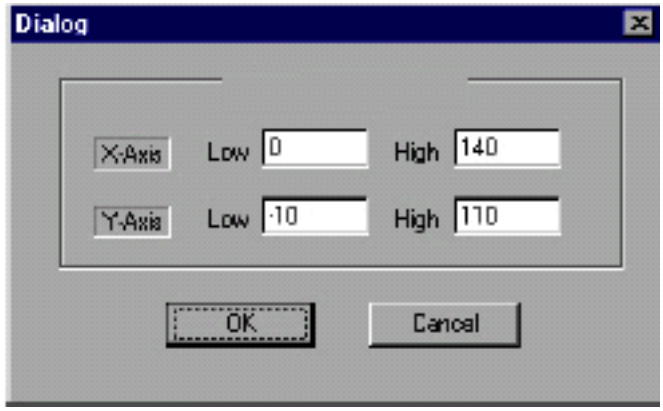

Figure 124 Scale Settings

Signature Summary

The *Signature Summary* (Figure 125) shows measured temperature, signature setting, input/output parameters, time stamp, saved location, and user free signature notes.

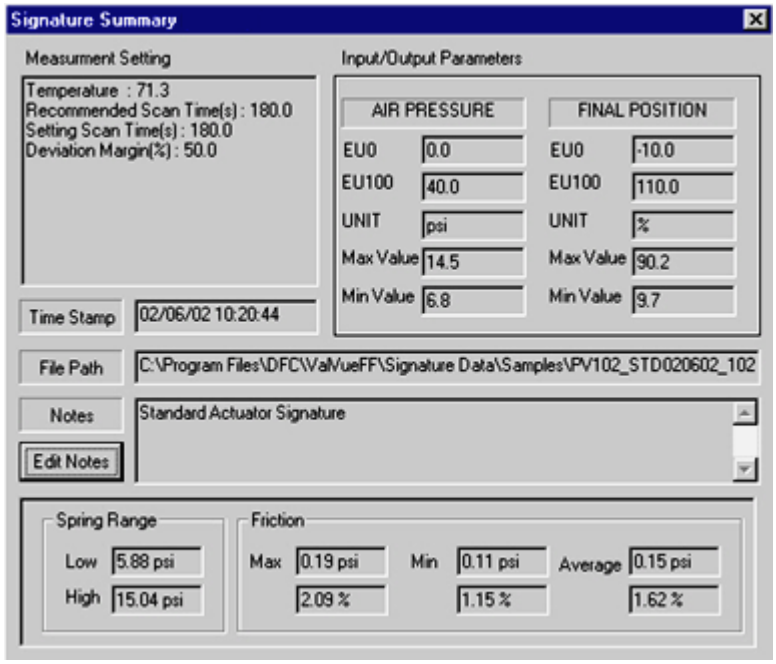

Figure 125 Signature Summary Dialog Box

Measurement Setting The signature measuring conditions.

Input/Output Parameters	Signature input and output parameter properties including engineering unit, range limits, maximum and minimum measured value.
Time Stamp	Signature measured time. The time is based on the published Fieldbus Foundation time.
File Path	Full path name if the data is loaded from a file.
Notes	Signature notes written down by user to record memos such as valve or positioner conditions. The note can also be modified by selecting the **Edit Notes** button.
Result Analysis	According to the result of standard actuator signature, system performs data analysis automatically. The analysis items include *Spring Range* and *Friction*. This feature apply to standard actuator signature only.

Displaying a Signature Summary

There are two ways to show *Signature Summary*

1. Right-click the mouse on a graph field.
2. Select the **Curve** and then **Measurement Summary**.

   or

1. Click **Show Legend** on the graph field.
2. Double-click the item listed in the legend box.

Signature Notes

Use *Signature Notes* (Figure 126) for writing down the condition of the control valve or the positioner when performing the signature tests. *Signature Notes* can be entered either before signature starts or after it is performed. There are three ways to record signature notes.

- ❑ Write down notes before signature starts.
- ❑ In the *Signature Page,* use the *Signature Notes* edit field. See “Signature Selection Frame” on page 139.
- ❑ At the *Signature Graph* window:

1. Right-click the mouse on the graph area.
2. Select a curve that requires signature notes.
3. Select **Signature Notes**. A *Signature Notes* dialog box opens.

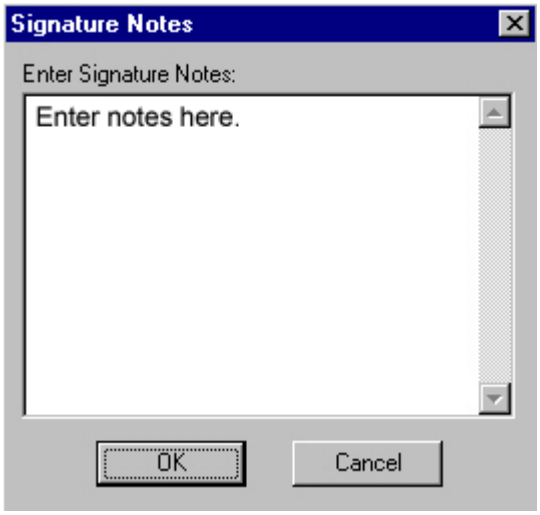

Figure 126 Signature Notes

4. Enter notes and click **OK**.

Signature Setting Frame

This frame consists of changing the settings for performing the various signature tests.

Standard Actuator Signature

Standard Actuator Signature measures and saves the data of static characteristic of the control valve. The input parameter is output pressure (Equal to MEAS_PRESS_AIR); and the output parameter is the feedback signal (Equal to FINAL_POSITION_VALUE.Value). In measuring the signature, FVP obtains 18 data sets. (Pressure data and Position data is one set.) The measuring point is the round trip of 10, 20, 30, 40, 50, 60, 70, 80, and 90% of span (Figure 127).

Before measuring the actuator signature, FVP performs offset measurement, the same procedure as in Auto Tune, to prepare for the measurement.

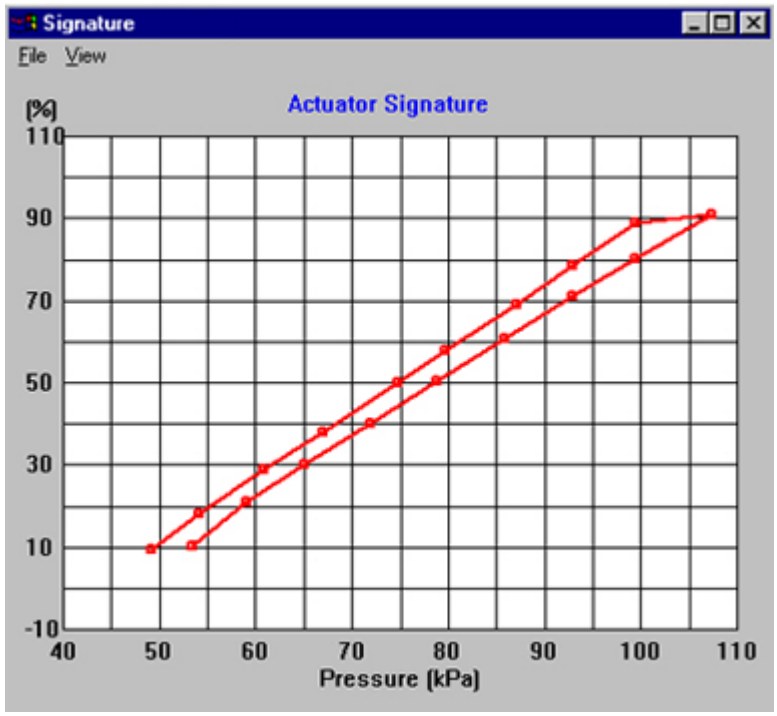

Figure 127 Standard Actuator SIgnature Graph

Measurement Parameters

To open the *Signature Setting* dialog box (Figure 128):

❑ Click **Standard Actuator Signature** and then **Change Measurement Setting**. There are three measurement setting parameters (Figure 128):

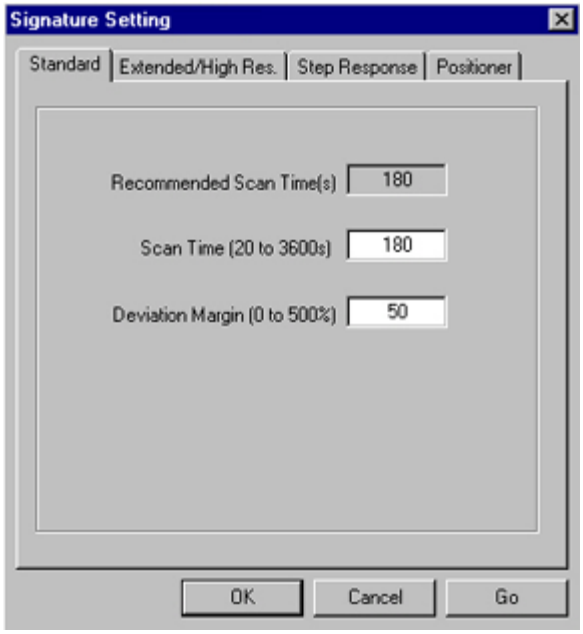

Figure 128 Standard Actuator Signature Settings Dialog Box

Recommended Scan Time (seconds) — The value is read only and does not affect the measurement. The value is calculated from the tuning parameters. It is used as a guide for setting *Scan Time* (in seconds).

To get the result in shorter period, decrease the *Scan time*. To get more specific information, choose a longer time to get more sample points.

Scan Time (seconds) — This determines the time for round trip of the measurement. You can set any value within the valid range: 20 to 3600 sec. Refer to the *"Extended Actuator Signature" on page 151.*

Deviation margin (%) — The measurement is performed in Proportional control algorithm. In this measurement, deviation between the set point value and the position value can occur due to the non-linear characteristic existing in the control system. Some examples are I/P hysteresis and valve deadband. This value does not need to be changed from the default value. However, if the stem position did not reach the desired point then increase this value, or if stem position far exceeds the desirable point, then decrease this value to make the measurement correct. The valid range is 0 to 500%.

Extended Actuator Signature

This measures the in-out characteristics of the control valve in the user-defined range. The total number of data is 100 sets (Figure 129).

The input parameter is output pressure (Equal to MEAS_PRESS_AIR); and the output parameter is the feedback signal (Equal to FINAL_POSITION_VALUE.Value).

Before measuring the extended actuator signature, FVP performs an offset measurement, the same procedure as the one in Auto Tune. This prepares for the measurement if the selected measuring mode is not set to *Measure All*.

In measuring the extended actuator signature, FVP obtains 100 data sets. Position data and pressure data is one set. There are two data acquisition modes: Position related data acquisition and time sampling related data acquisition. Normally, data is acquired according to the addressed measuring position point. When the valve is saturated and cannot reach the measurement point, the data acquisition mode is switched to time sampling.

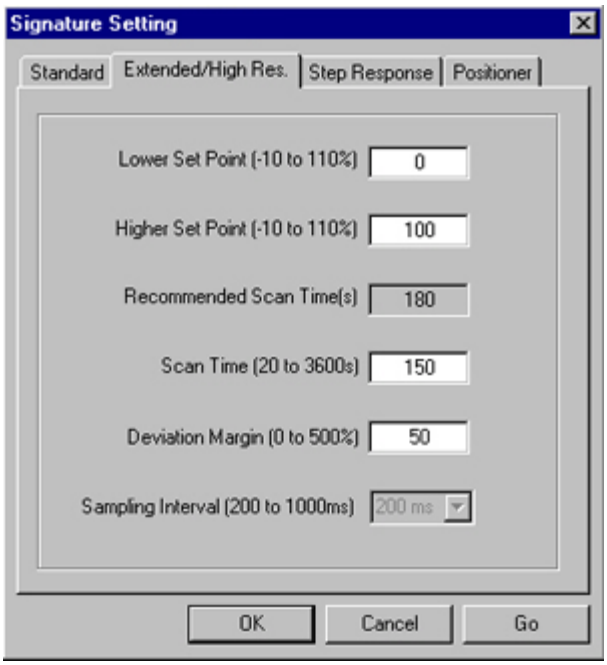

Figure 129 Extended Signature Dialog Box

Measurement Parameters

The measurement setting parameters determine the condition of measurement. The parameters consist of six float arrays. This group of parameters is shared with High Resolution Actuator signature.

Lower Set Point: Lower measuring range; valid range is -10 to 110%.

Higher Set Point Higher measuring range; valid range is -10 to 110%.

Recommended Scan Time [s]	Recommended scanning time.
Scan Time[s]	This determines the measuring time. Use *Recommended Scan Time* as a guide to set the scanning time. Scanning time: 20 to 3600 sec. To get the result in shorter period, decrease the *Scan time*. To get more specific information, choose a longer time to get more sample points.
Deviation Margin[%]	Allowable deviation. - The measurement is performed in Proportional control algorithm. For this reason, deviation between the set point value and the position value can occur due to the non-linear characteristic existing in the control system. (I/P hysteresis, Valve deadband etc.). Basically, this value does not need to be changed from the default value. But, if the stem position did not reach the desirable point, then increase this value or if stem position far exceeds the desirable point, then decrease this value to make the measurement correctly. The valid range is 0 to 500%.
Sampling Interval [ms]	This parameter is used for *High Resolution Signature* only. Sampling rate: 200 to 1000 ms.

High Resolution Actuator Signature

Use this for measuring the actuator signature in high resolution. The function measures the in-out characteristic of the control valve in time sampling mode. The number of measuring samples depends on the time of round-trip, and can be obtained by the following calculation:

(Scan Time/Sampling rate) x 1000 [point]

Before measuring the signature, FVP performs an offset measurement, the same as in Auto Tune, to prepare for the measurement. For parameter details refer to “Extended Actuator Signature” on page 151.

Step Response Test

This signature function measures the step response characteristic of the control valve system. There are two types of step response tests: single step response test and multiple step response test (Figure 130).

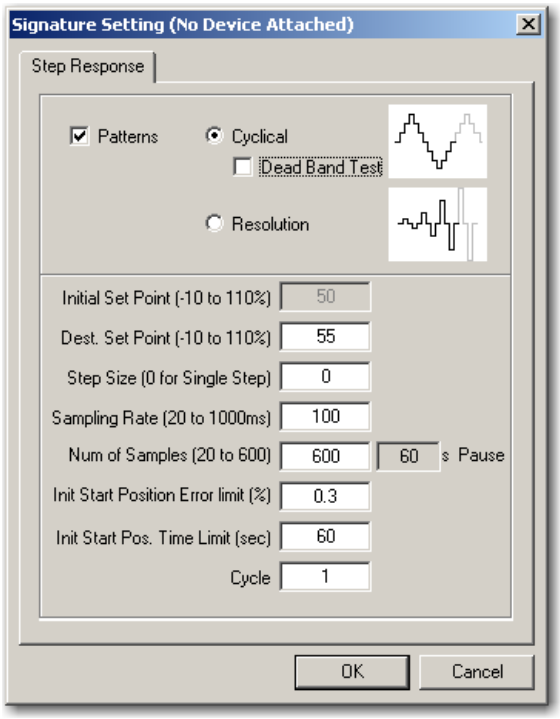

Figure 130 Step Response Setting Dialog Box

The multiple step response test consists of a series of single step response tests with a new set point for each following test incremented by the step size, executed consecutively in the overall user-specified range. All individual single step tests use the same user-specified step size, except the last one which uses the step size of the remaining portion as a unit of test.

Position data before the step change is required in order to determine the starting point. The FVP collects 10 samples of data before the each step input is applied.

The measurement parameter is the output signal of the control valve system: Feedback signal of FVP (Equal to FINAL_POSITION_VALUE.Value)

Measurement Setting Parameters

The measurement condition defines the following parameters:

Patterns Click this checkbox to enable *Cyclical* and *Resolution* testing:

CAUTION *The FVP must be OOS.*

- ❑ Cyclical w/o Deadband- Click this radio button to enable cyclical testing. Cyclical testing moves the valve from initial set point to destination set point cycle and cycles again. This selection activates the Cycle field at the bottom of the dialog box. enter the number of cycles for performing the test. 2-way testing is unavailable.This test starts from 50% and uses a fixed step size over a user-set number of cycles. If there are N steps from initial set point to destination set point, it:
  - ❑ Moves N steps in increasing position.
  - ❑ Moves 2N steps in decreasing position.
  - ❑ Moves N steps increasing to the 50% position.
- ❑ Cyclical w/ DeadbandDead Band Test - Click this and the Cycles field is set to 1. This test discovers the range where the setpoint increases but the valve does bot move. The dead band formula is: Dead Band = (number of steps the valve does not move) * Step Size.
- ❑ Resolution - Click this to enable resolution testing, which moves the valve from initial set point for a small step toward the destination set point, and doubles the step in the next time until it reaches the destination set point. 2-way testing is unavailable.

Initial Set Point The base position for step test from which the set point changes by the amount of the step size. If the step test uses the pre-defined patterns (Cyclical and Resolution), the value should be *50*.

Dest. Set Point The destination position. If it is in Resolution patterns step test, it is the last cycle's destination position.

Step Size The size of each step change. Used for multiple step response test only. If the step size is 0, the multi-step test becomes the single step test in the range specified by the *Initial Set Point* and the *Dest. Set Point*.

- ❑ For *Cyclical*, the step size is the range specified by the start point and the end point if the step size is 0.
- ❑ For *Resolution*, the step size means the first step size (in the first cycle), The default value is 5% if the step size is 0.

Sampling Rate (ms) The sampling rate of each step: range is 20 to 1000 ms.

Num of Samples	Sampling points of each step: range is 20 to 600 points. *Pause* displays the delay before sampling begins. When the step test begins, the valve operates and sampling begins. Once the sampling number reached, it moves to the next step. The time between the steps is *Pause*. Sample points are collected in *Pause* time but due to command delay, sample points can also be found on the graph when the valve is moving.
Initial Start Position Error Limit (%)	The maximum error allowed between the actual position (FINAL_POSITION_VALUE) and the user-selected *Initial Set Point* before starting the test. The minimum value is 0.1 if the step size greater than 0.2, otherwise the minimum value must be greater than a half of the step size.
Initial Start Position Time Limit(sec)	Maximum waiting time, stabilizing time, allowed after premove. Used for multiple step response test only.
2-Way (round trip) Selection	The values of the *Initial Set Point* and the *Dest. Set Point* determine the direction of the valve stem movement. When the value of the *Initial Set Point* is more than that of the *Dest. Set Point*, the valve steps down in one way trip, then steps up at return trip if 2-way selection specified.

Multi Step Response Test Notice

The graph produced by a multi step response test (Figure 131), does not show actual time in the time axis because there is loading data time between the two steps.

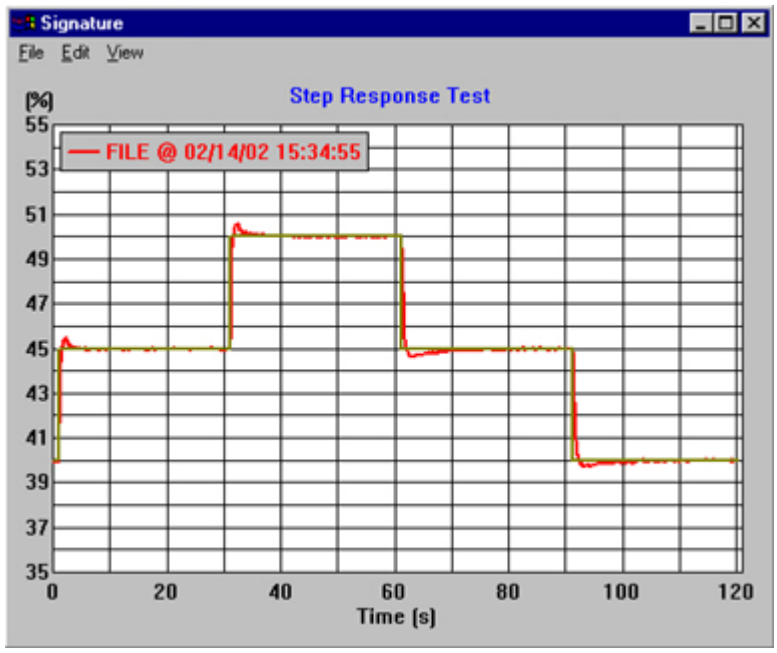

Figure 131 Step Response Test Graph

Therefore, the application displays a dialog box at the center of the graph area after a multi step response test is performed (Figure 132). This dialog box displays only once.

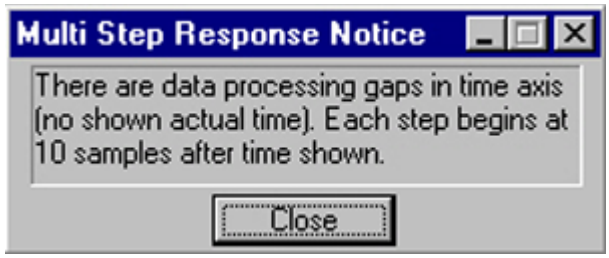
Multi Step Response Notice
There are data processing gaps in time axis (no shown actual time). Each step begins at 10 samples after time shown.
Close

Figure 132 Step Response Notice

Step Response Patterns

This section gives examples of a step response setup for normal, *Cyclical*, *Cyclical* with *Deadband* and *Resolution*.

Normal

Figure 132 shows the data setup to produce the graph in Figure 134 and the tabular results in Figure 135.

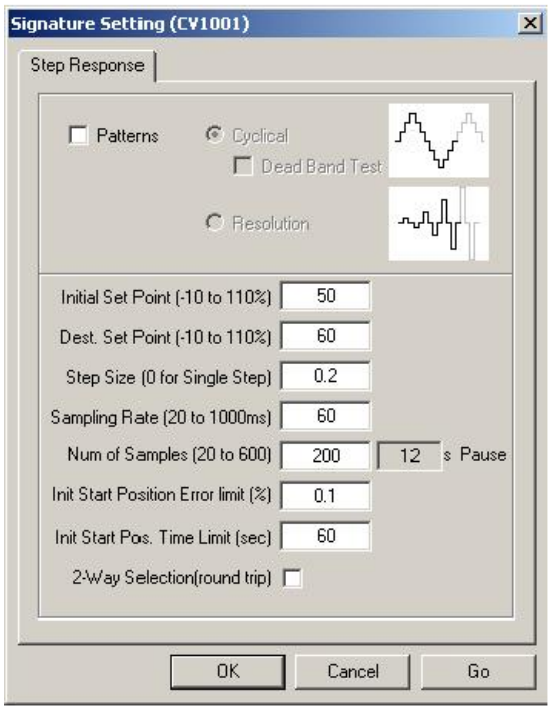

Figure 133 Step Response Setup - Normal

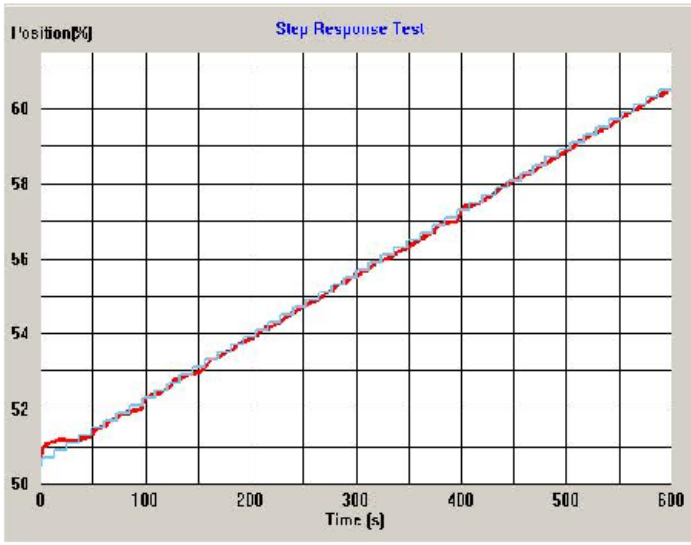

Figure 134 Test Graph Result - Normal

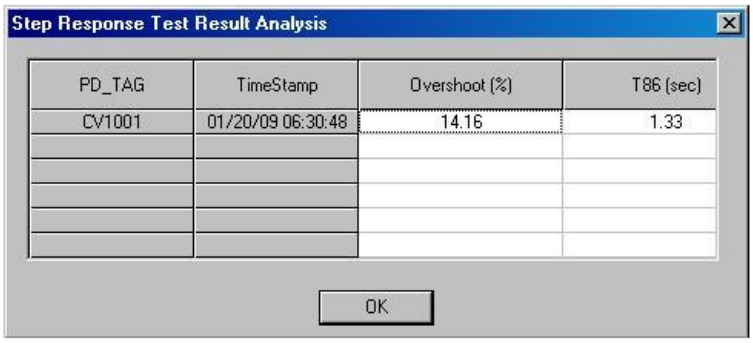

Figure 135 Result Analysis - Normal

Cyclical

Figure 136 shows the data setup to produce the graph in Figure 137 and the tabular results in Figure 138.

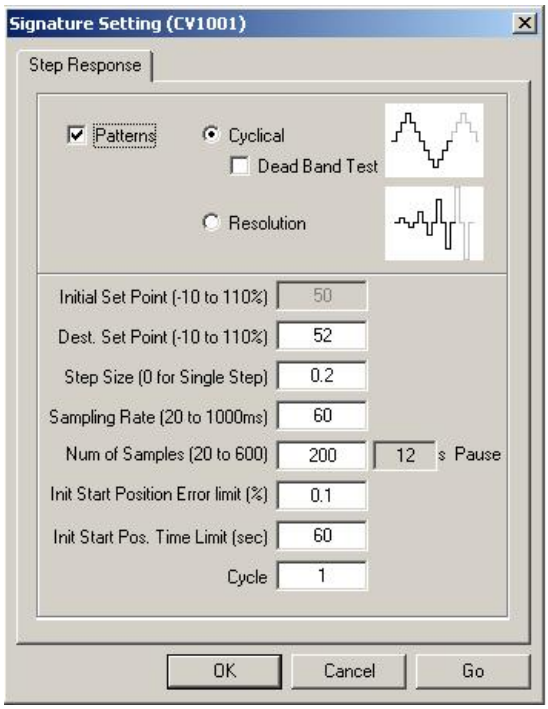

Figure 136 Step Response Setup - Cyclical

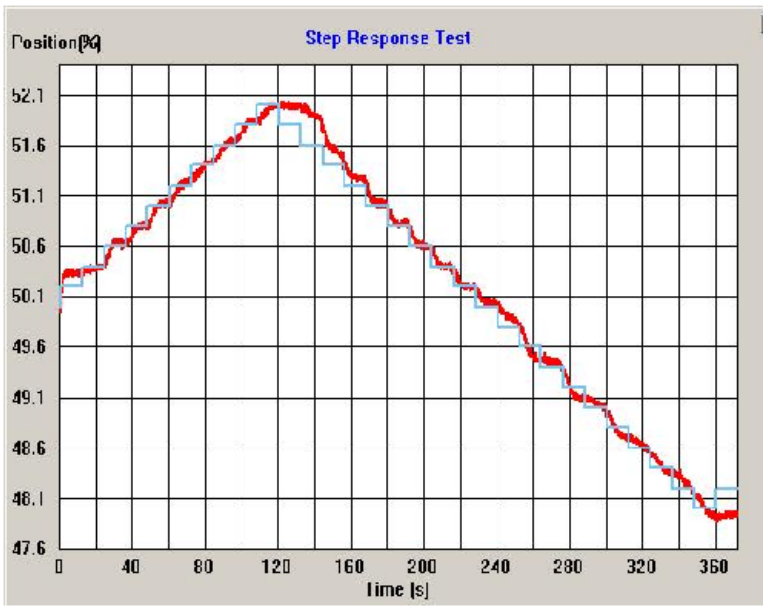

Figure 137 Test Graph Result - Cyclical

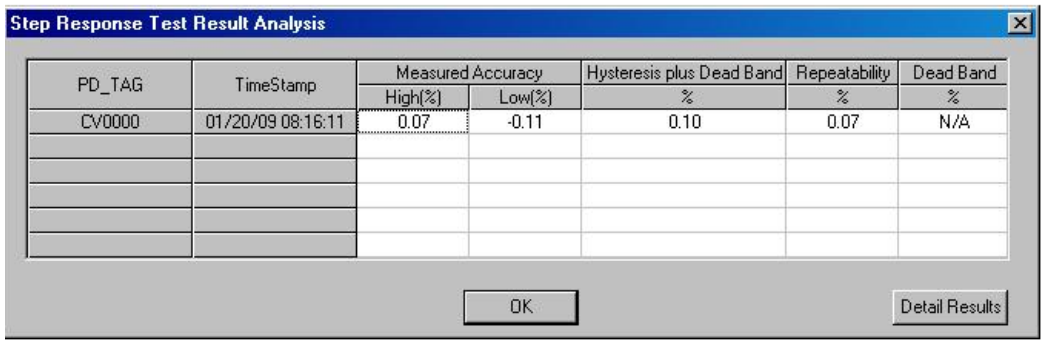

Figure 138 Result Analysis - Cyclical

Cyclical with Deadband

Figure 139 shows the data setup to produce the graph in Figure 140 and the tabular results in Figure 141.

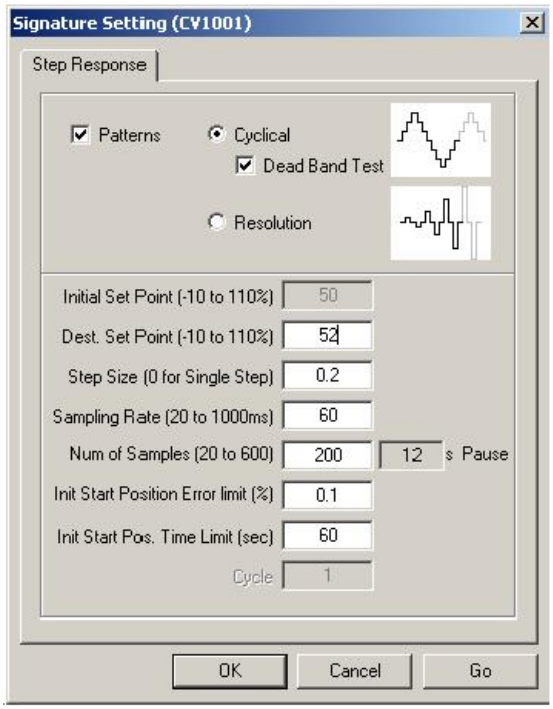

Figure 139 Step Response Setup - Cyclical with Deadband

In Figure 140 the Step Size is 0.2% and the Dead Band area is circled by pink color. In this area, the Set Point decreased 0.2%, but the valve did not move. So the Dead Band is 0.2% (one step size, Dead Band = number of steps that valve was not responding * Step Size).

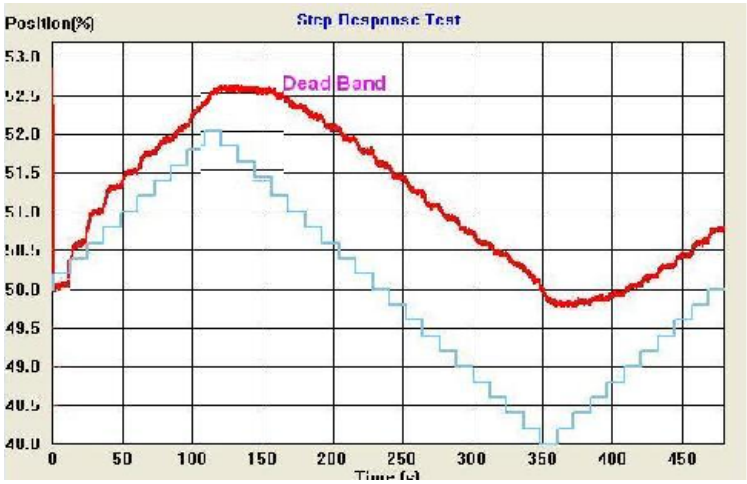

Figure 140 Test Graph Result - Cyclical with Deadband

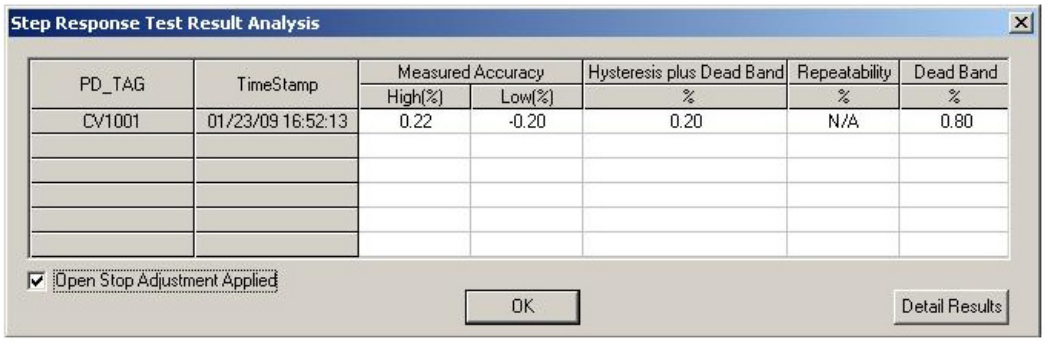

Figure 141 Result Analysis - Cyclical with Deadband

Resolution

Figure 142 shows the data setup to produce the graph in Figure 143 and the tabular results in Figure 144.

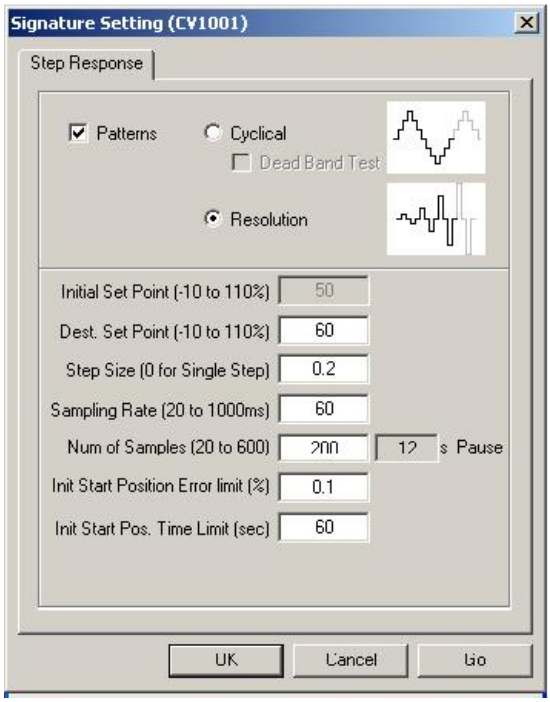

Figure 142 Step Response Setup - Resolution

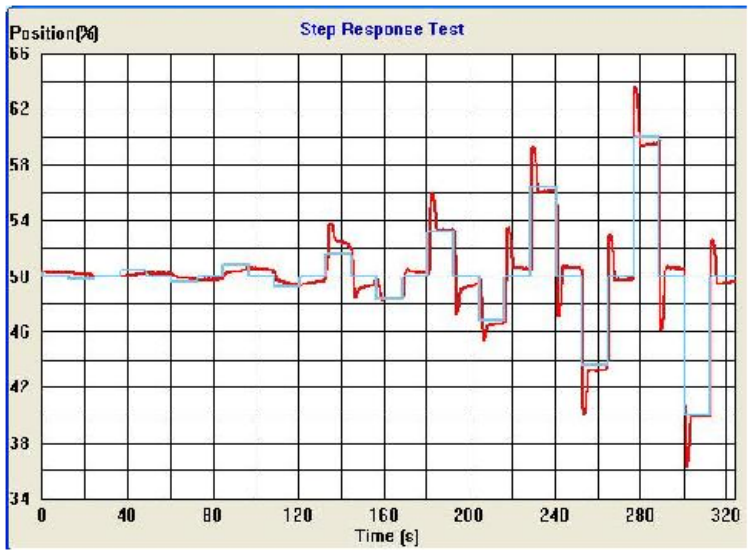

Figure 143 Test Graph Result - Resolution

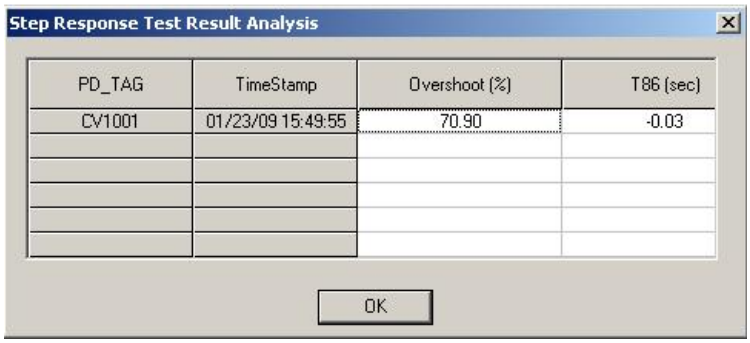

Figure 144 Result Analysis - Resolution

Positioner Signature

This signature function measures the static characteristics of the control valve system.

The application applies the Input signal to the FVP and waits until the valve stem settles then obtain the position data. The measurement is proceeded in the round trip.

Input signal of the control valve system: Input signal of FVP (Equal to AO Block OUT.Value) Output signal of control valve system: Feedback signal of ValVueFF (Equal to FINAL_POSITION_VALUE.Value) The Low Cut, High Cut, Position Characterization and other functions related to Positioning in Transducer block are reflected in measuring Positioner signature. This helps the user to check the setting of FVP visually.

Measurement Setting Parameters

The measurement setting parameters consist of five float arrays (Figure 145):

- *Lower Set Point Signal (-10 to 110%)* - Determines input signal to start the measurement.
- *Higher Set Point Signal (-10 to 110%)* - Determines the highest input signal in the measurement.
- *Intervals (4 to 20 points)* - Determines the measurement points of this signature function. Width of measurement point is determined in equation:
  *Width = (Higher Set point signal - Lower Set point signal)/Intervals Total Sample points (collected in round trip)=2*Intervals+1*
- *Recommended Wait Time(s)* - It can be used as a guide for setting wait time (read only).
- *Wait Time (5 to 300 sec)* - Determines the data acquisition que time for each measurement.

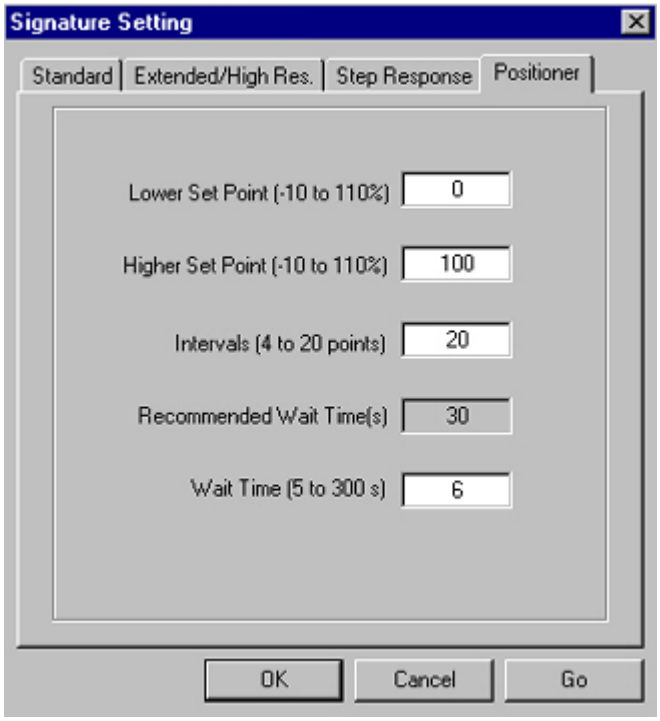

Figure 145 Position Signature Setting Dialog Box

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Query and Reporting Services

12

Query Services

Query Device General Tab

Query Services are useful for viewing each FVP parameter. Access this by several methods:

- ❑ From the *Device Query* icon in the tool bar,
- ❑ From the *IVI*, or *PID* dialog box,
- ❑ and by right-clicking a selected device in the device tree.

Open as many as 30 *Query* dialog boxes simultaneously to examine parameters in the device and in selected function blocks. A query remains active even when the device to which it is directed is no longer the selected device. To perform a general inquiry:

1. Select a parameter from the pulldown list (Figure 146).

Figure 146 Query Device Dialog Box - General Tab Pulldown List

2. Select **Read** and the reply field populates (Figure 147).

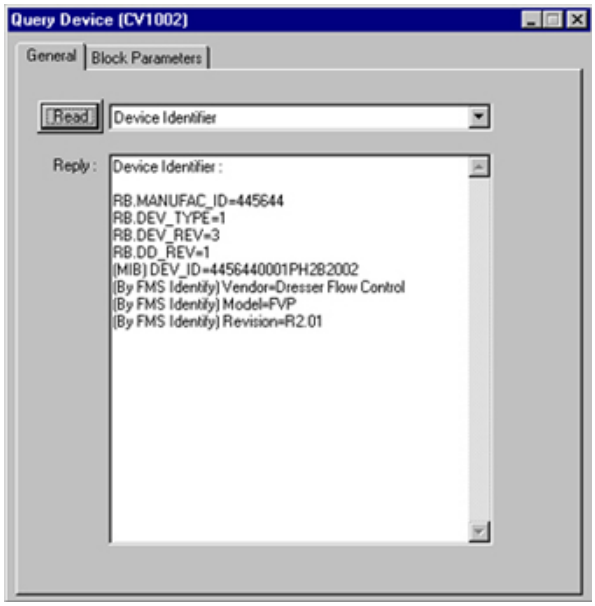

Figure 147 Reply List Populated

Query Device Block Parameters Tab

The *Block Parameters* tab (Figure 148) provides access to every parameter in each selected block. For the *expert technician* it provides detailed information not available in the *Configuration* and *Tuning* dialog boxes. For interpretation of the parameters and their units and data structure see the FVP instruction manual. In the example shown in Figure 148, the simple parameter MODE_BLK reveals that the mode of the Transducer block is set to *OOS*, Out Of Service.

Figure 148 Query Device Dialog Box - Block Parameters

To see the parameter value:

1. Select a parameter from the pull-down list (Figure 149) using the scroll bar.
2. Select **Read**.

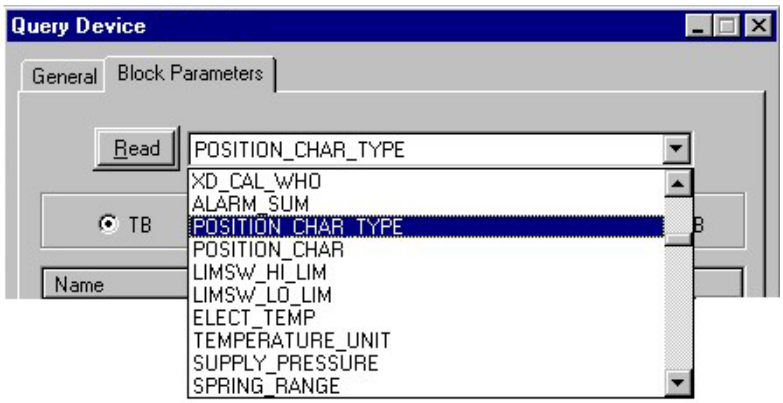

Figure 149 Parameter Pull Down List

3. Access the *Parameter Attribute* dialog box (Figure 150) from the *Block Parameter* page by right-clicking on the **Parameter** name field. This dialog box displays the attributes of the parameter as described in the DD file.

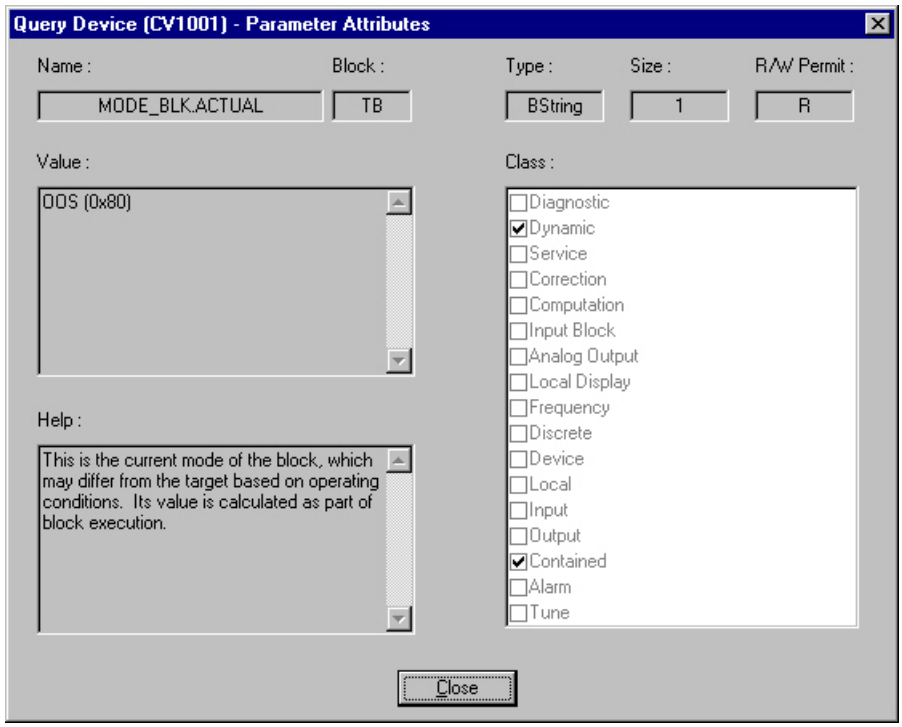

Figure 150 Parameter Attribute Dialog Box

Reporting Services

Configuration Report

This program provides a *Configuration Report* feature that captures a snapshot of all configuration data currently contained in and related to the selected device. The data is organized into groups that are consistent with the format of the configuration user interface.The report can be either HTML format or TEXT format (Figure 151). The HTML-based is browser independent. It is best viewed with the latest browser versions. To generate a report:

1. Select **File > Generate Report**. A dialog appears (Figure 151).

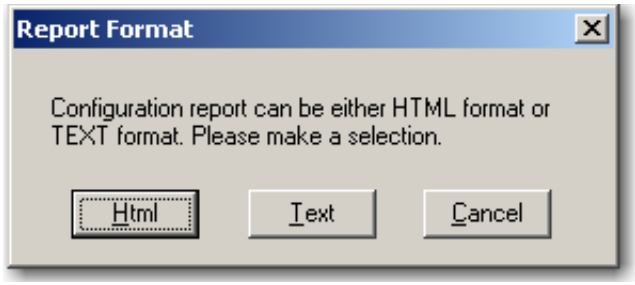

Figure 151 Report Format Dialog Box

2. Select **HTML** or **TEXT**.

If you select HTML format, the default browser opens the ValVueFF configuration report as a Web Page similar to that shown in Figure 152. The appearance differs by browser.

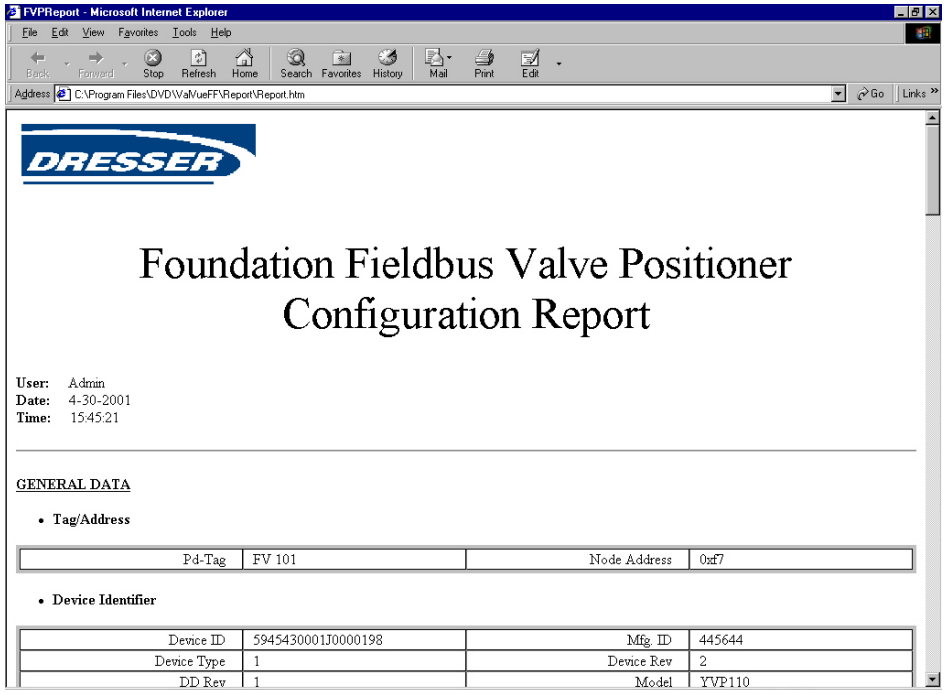

Figure 152 Configuration Report in a Browser

To save the report into a file:

❑ Select **File Save** on the browser menu bar.

To print a hard copy of the report:

❑ Select **File Print** from the browser menu bar. Or use the browser Print and Save toolbar icons

Using Report Generation

Configurations that are saved for downloading (.dmp files) to devices can be viewed with the *Report Generator* offline:

1. Right-click **Offline** and then select **Open** and a dialog appears (Figure 153).

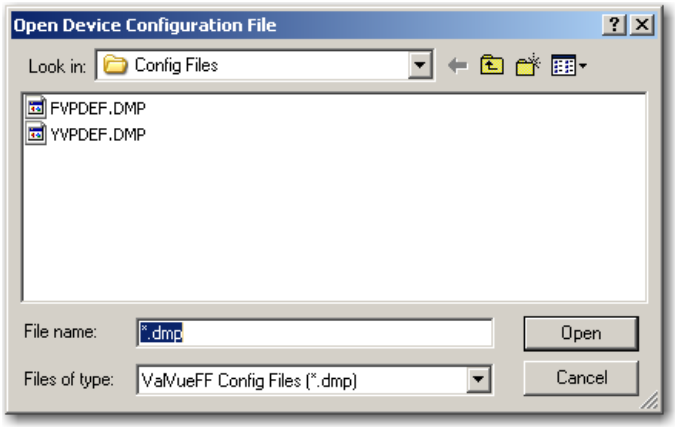

Figure 153 Open Device Configuration File

2. Select the configuration file that has the desired data and click **Open**. The offline device loads the data.
3. Select **File > Generate Report** to view and to print the data from your browser.

Communication Error Log

Occasionally, Foundation Fieldbus reports communication errors. For example, if there is a loose or intermittent connection between the fieldbus segment the NI-FBUS card interface then communication errors can occur. ValVueFF displays a warning dialog box. The first error requires acknowledgement, select **OK** to close the dialog box. Errors are recorded in the *Communication Errors* text box (Figure 154). The error log can be saved to a text file.The error log in Figure 156 was generated when the connection to the segment was repeatedly disconnected.

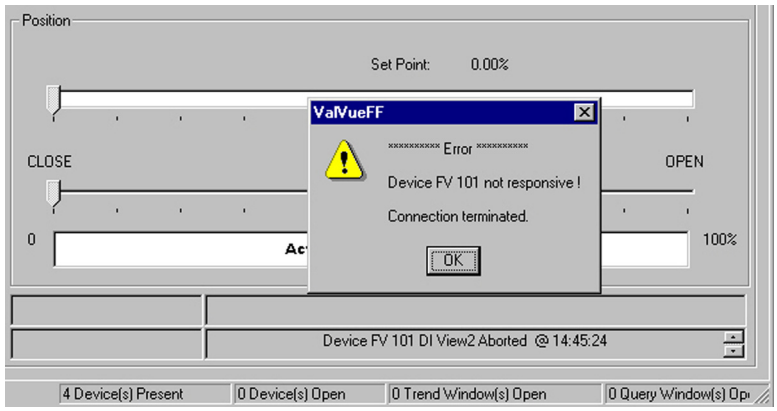

Figure 154 Communication Error Message Box

Saving an Error Log

Use the following procedure to save an error log:

1. Right-click on the error log text box. A menu box appears.
2. Select **Select All**. There can be many lines of errors although only one shows in the text box.
3. Select **Copy** (Figure 155).

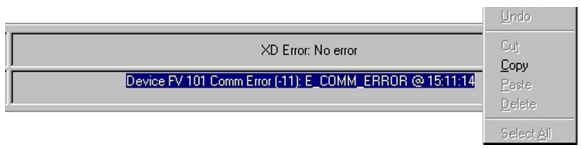

Figure 155 Drop Down Menu

4. Open a text document with any text editor.
5. Paste the log into the text editor.
6. Save the log to an assigned folder.

Device FV 101 DI View2 Aborted @ 15:10:19
Device FV 101 DI View2 Aborted @ 15:10:19
Device FV 101 PID View3 Aborted @ 15:10:21
Device FV 101 PID View3 Aborted @ 15:10:21
Device FV 101Error (-5): E_BAD_ARGUMENT @ 15:10:21
Device FV 101 DI View2 Aborted @ 15:10:21
Device FV 101 DI View2 Aborted @ 15:10:21
Device FV 101Error (-5): E_BAD_ARGUMENT @ 15:10:27
Device FV 101Error (-5): E_BAD_ARGUMENT @ 15:10:34
Device FV 101 Comm Error (-11): E_COMM_ERROR @ 15:11:14
Device FV 101 Comm Error (-14): E_OBSOLETE_DEVICE @ 15:14:35
Device FV 101 Comm Error (-14): E_OBSOLETE_DEVICE @ 15:14:35
Device FV 101 DI View2 Aborted @ 15:14:35
Device FV 101 DI View2 Aborted @ 15:14:35
Device FV 101 Comm Error (-11): E_COMM_ERROR @ 15:14:52

Figure 156 Error Log

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Failsafe Handling

13

Introduction

For the selected positioner, ValVueFF constantly monitors the status of the Transducer Block (TB) actual valve position parameter FINAL POSITION VALUE to report and manage Failsafe events. The actual status of Failsafe is determined by the parameter RELEASE FAILSAFE in TB. To configure the *Time 2* parameter to force Failsafe because of sustained deviation, refer to "Configuration Services" on page 79. If the IVI is open, the *Fail Safe Status* window automatically opens to display a Failsafe status. The window can be opened manually from the *View* menu. Once the *Fail Safe Status* window is displayed it remains open until you close it.

Failsafe Active Latched

The *Fail Safe Status* window (Figure 157) appears when the selected device is in *Active Latched* condition.

Figure 157 Active Latched

Failsafe Clear Latched

The *Fail Safe Status* window is updated with the *Failsafe Clear Latched* condition (Figure 158), when the active condition is cleared. The *Clear Latch* button is enabled to clear the latch. If the positioner is not in out of service (OOS) operation state, required for clearing the latched state, you are prompted to switch to OOS state.

Figure 158 Clear Latch

Failsafe Clear Non-Latch

The *Fail Safe Status* window is updated to the *Failsafe Clear Non-Latch* condition when the latch is cleared.

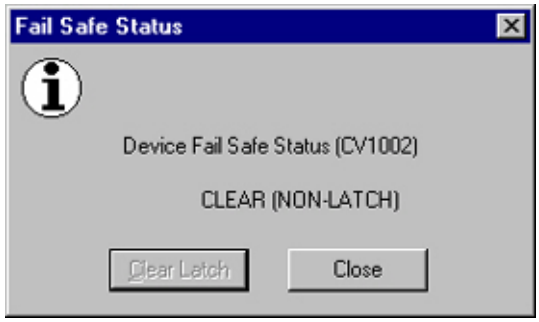

Figure 159 Clear Non-Latch

Exiting Failsafe

Failsafe cannot be cleared until the original cause is corrected. See “Error Messages” on page 207 for additional information about fault correction. After the problem cause is corrected, the *Failsafe* dialog box shows *Clear*, *Latched*. Select the **Clear Latch** button and select **Close** on the *Clear, Non-Latch* button.

Certain combinations of configuration parameters can complicate exiting failsafe. Typically non-standard travel calibration coupled with tight shutoff, full open, and or position limits may need to be cleared before exiting failsafe. If the *Time 2 (T2) Deviation* parameters are set, the following four cases might be found for failsafe. Follow the steps in Table 12 and Table 13 to exit failsafe for these cases.

Failsafe Examples One and Three

Table 12 and Table 13 list two failsafe examples. Table 14 and Table 15 on page 179 cover two more fail-safe examples. Detailed instructions for exiting failsafe follow these tables.

Table 12 Failsafe Case One

Case One	Failsafe Type	Actuator Action	Cause of Failure
Observable Behavior: Valve fails closed with low actuator pressure. After pressure problem is corrected the valve is closed in failsafe.	Deviation Error	Air to Open Fail Close	Loss of supply or low actuator pressure
XD Error: Deviation error appears in the error status. The *Failsafe Status* dialog box displays and shows *Active, Latched*.			

Table 13 Failsafe Case Three

Case Three	Failsafe Type	Actuator Action	Cause of Failure
Observable Behavior: Valve fails to open with high actuator pressure. After pressure problem is corrected the valve is closed in failsafe.	Deviation Error	Air to Open Fail Close	High actuator pressure
XD Error: Deviation error appears in the error status. The Failsafe Status dialog box displays and shows *Active, Latched*.			

Exiting Failsafe

Use this procedure to exit the failsafe mode for cases one and three:

Step One

1. Restore the air supply or correct the actuator problem.
2. Check that the pneumatics are working correctly.
3. Move the *Failsafe* dialog box to one side of the screen to uncover the *IVI* display.
4. If the PID dialog box is open, close it.

Step Two

This step requires permission level 3, 4, 8 or 9:

1. Open the *Operation State* dialog box.
2. Select **Manual**
3. Select **OK**.
4. Enter the *Actual Position* value, from step one, in the *Set Point* text box.
5. Select **OK**.
6. If the *Failsafe* dialog box changes to *Clear (Latched)*, select the **Clear Latch** button.
7. Select **OK** when the dialog box request a change to OOS.
8. If the *Failsafe* dialog box remains in *Active (Latched)* proceed to Step Three.

Step Three

This step requires permission level 3, 4, 8 or 9:

1. Open the *Configuration* dialog box.
2. Select the **Position** tab.
3. Set the *Tight Shutoff and Position Low Limit* parameters to *-10* lower than the *Actual Position* value.
4. Set the *Time 2* parameter to *-1* (Figure 160).

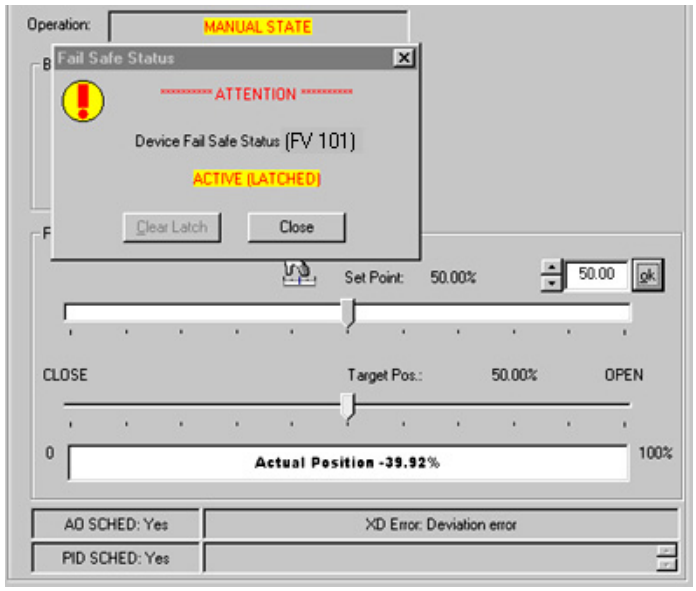

Figure 160 Failsafe Step 1 and 2

5. Select **OK** to accept the changes.
6. Select **Yes** when a dialog box warns of a change to OOS state. The *Failsafe* dialog box changes to *Clear (Latched)*.

7. Select the **Clear Latch** button.
8. Select **Yes** when the dialog box request a change to OOS.

Step Four

This step requires permission level 2, 3, 4, 8 or 9:

1. Open the *Operation State* dialog box.
2. Select **Manual**.
3. Select **OK**.
4. Enter the *Actual Position* value in the *Set Point* text box.
5. Select **OK**.

Step Five

This step requires permission level 3,4,8 or 9:

1. Open the *Configuration* dialog.
2. Select the **Position** tab.
3. Set the *Tight Shutoff* and *Position Low Limit* parameters to *-10* lower than the *Actual Position* recorded in Step 3.
4. Set the *Time 2* parameter to *-1* (Figure 161).

Before Normal Configuration **After getting Out of Failsafe Configuration**

Figure 161 Resetting Failsafe Parameters

5. Select **OK** to accept the changes.
6. Select **Yes** when a dialog warns of a change to OOS state. The *Failsafe* dialog changes to *Clear (Latched)*.
7. Select the **Clear Latch** button.
8. Select **Yes** when the dialog requests a change to OOS

Step Six

This step requires permission level 2, 3, 4, 8 or 9:

1. Open the *Operation State* dialog.
2. Select **Manual**.
3. Select **OK**.
4. Enter the same value as the *Actual Position*, recorded in Step 3, in the *Set Point* text box.
5. Select **OK**. The *Fail Safe Status* dialog box appears (Figure 162).

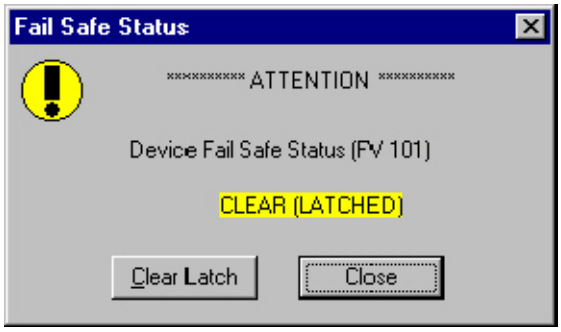

Figure 162 Clear (Latched) Failsafe Status

6. Select **Clear Latch** and a message appears (Figure 163).

ValVueFF
Error: Write TB RELEASE_FAILSAFE is only allowed in OOS mode.
Do you want to switch the device into Out of Service Operation State?
Yes
No

Figure 163 Confirm Change to OOS to Clear Failsafe

7. Select **Yes** to release failsafe. Return to Manual Operation state to resume manual operation of the valve. Follow the plant procedure to return to automatic control. The Deviation Error Failsafe configuration can be restored later by resetting the T2 parameter in *Configuration* > *Position*.

CAUTION

Setting the T2 Parameter to cause failsafe after a sustained position error can cause unwanted process shutdown. Use the T-2 cautiously. Avoid interaction with other configuration parameters, particularly High and Low Position Limits.

Failsafe Examples Case Two and Four

Table 14 Failsafe Case Two

Case Two	Failsafe Type	Actuator Action	Cause of Failure
Observable Behavior: Valve fails closed with high actuator pressure. After pressure problem is corrected the valve is open in failsafe. As the problem is corrected the valve can move past setpoint and go to clear latch briefly.	Deviation Error	Air to Close Fail Open	High actuator pressure plugged nozzle?
XD Error: Deviation error appears in the error status. The *Failsafe Status* dialog box displays and shows *Active, Latched*.			

Table 15 Failsafe Case Four

Case Three	Failsafe Type	Actuator Action	Cause of Failure
Observable Behavior: Valve fails to open with low actuator pressure. After pressure problem is corrected the valve is open in failsafe.	Deviation Error	Air to Close Fail Open	Supply pressure failure or low actuator pressure, plugged nozzle?
XD Error: Deviation error appears in the error status. The *Failsafe Status* dialog box displays and shows *Active, Latched.*			

Exiting Failsafe

Use this procedure to exit the failsafe mode for cases two and four:

Step One

1. Restore the air supply or correct actuator problem.
2. Check that the pneumatics are working correctly.
3. Move the *Failsafe* dialog box to one side of the screen to uncover the *IVI* display. If the *PID* dialog box is open, close it.
4. Record the *Actual Position*. An example is 103.41%. In this extreme example, the valve calibration allows for large over-travel between the open stop and 100% position.

Step Two

This step requires permission level 3,4,8 or 9:

1. Open the *Operation State* dialog box.
2. Select **Manual**
3. Select **OK**.
4. Enter the *Actual Position* value in the *Set Point* text box.
5. Select **OK**.
6. If the *Failsafe* dialog box changes to *Clear (Latched)*, select the **Clear Latch** button. The dialog box requests a change to OOS.
7. Select **Yes**. If the *Failsafe* dialog box remains in *Active, (Latched)*, proceed to the next step**.**

Step Three

This step requires permission level 3,4,8 or 9:

1. Open the *Configuration* dialog box.
2. Select the **Position** tab.
3. Set the *Full Open Above (FAO)* and *Position Low Limit* parameters to *+10* higher than the *Actual Position* recorded in Step 3.
4. Set the *Time 2* parameter to *-1*.
5. Select **OK** to accept the changes.
6. Select **Yes** when a dialog box warns of a change to OOS state.The *Failsafe* dialog box changes to *Clear (Latched)*.
7. Select the **Clear Latch** button.
8. Close the *Failsafe* dialog box.

Step Four

This step requires permission level 2, 3,4,8 or 9:

1. Open the *Operation State* dialog box.
2. Select **Manual**.
3. Select **OK**.
4. Enter the desired valve position in the *Set Point* text box.

Step Five

This step requires permission level 3,4, 8 or 9:

1. Open the *Configuration* dialog box.
2. Select the **Position** tab.
3. Change *Position Limits*. The position limit changes made in Step 5 prevents failsafe action from occurring and disables *FOA* and *Position High Limit*. Unless there is a an important control consideration, do not change these values

Case 5: Internal Diagnostics

If the fault is caused by hardware failure, replace the defective component. Reconfigure the positioner with limits set as for cases 1 to 4.

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Glossary

A

0xf7	See hexadecimal. This is the number 247 represented in hexadecimal notation. The 0x preamble indicates hexadecimal notation.
1.#INF	This is the representation of infinity as expressed in IEEE 754 floating point arithmetic. It is used in fieldbus devices to set a parameter to a value that does not interfere with operation, such as for a limit, for example.
Actuator Type	The HART Communications Foundation classifies a positioner as type *Actuator*. This means that it receives a 4-20 mA control current signal and causes an actuation function. A device of type *Actuator* may not be connected to a circuit intended for a device of type *Transmitter*.
Algorithm	A set of rules that control the operation of an object through software. The FVP position control algorithm is a modified PID. Other algorithms embedded in FVP include the STOPS method for calibrating stroke, and the autoTUNE method for establishing the best parameters for the PID algorithm.
AO Analog Output Block	This block processes signal from control blocks to make them compatible with the control valve and passes them to the positioner's transducer block.
ATC (Air-to-Close)	The combination of a single acting actuator and the control valve where the valve is closed when air pressure is applied to the actuator. A spring opens the valve when air pressure is removed.
ATO (Air-to-Open)	The combination of a single acting actuator and the control valve where the valve is open when air pressure is applied to the actuator. A spring closes the valve when air pressure is removed.
AUTO	Automatic mode
Basic Device	This is any device not having the capability to control communications on an H1 fieldbus segment.
Capabilities File	This describes the communication objects in a fieldbus device. A configuration device can use Device Description (DD) Files and Capabilities Files to configure a fieldbus system without having the fieldbus devices online.

CAS Cascade mode	A string must be typed exactly in upper-case (capital) letters and lower case. For example *Admin* is the correct username of the ValVueFF administrator, but *admin* is rejected at logon.
Characteristic	The positioner input setpoint command can be selectively modified to provide a desired relationship between setpoint and valve position. In the valve, the relationship between stroke and Cv is also called valve inherent characteristic. It is often adjusted by design, to equal percentage, for example. The positioner characteristic is applied to modify the setpoint to travel relationship of the actuator. Choose the characteristic of the positioner to compliment the valve. If the valve is equal percentage, set the positioner to linear. If a linear valve is installed the positioner can be set to an equal percentage characteristic to improve flow control. FVP offers an eleven point custom characteristic option which can be easily created and edited in ValVueFF. Use local display to select the custom characteristic, but you cannot adjust the points.
Closed	The valve position in which the flow is minimum or zero. See tight shutoff.
Communications Stack	This is device communications software that provides encoding and decoding of User Layer messages, deterministic control of message transmission, and message transfer.
Compliance Voltage	The voltage that must be available at the control system output in order to drive the control current through the FVP and all the resistive devices in series with it.
Compliance, HART	Manufactured and tested in accordance with the HART Communications Foundation standards.
Condition Monitoring	A technology for measuring the performance of process equipment and valves over a period of time to predict the need for maintenance. The technology evolved to meet NRC requirements GL 89-10, and has proven valuable to other process industries. FVP and ValVueFF offer a suite of diagnostic tools to implement condition monitoring.
Connector	This is a coupling device used to connect the wire medium to a fieldbus device or to another segment of wire.
Control Loop	This is a group of Function Blocks (FBs) that execute at a specified rate within a fieldbus device or distributed across the fieldbus network.
Coupler	This is a physical interface between a Trunk and Spur, or a Trunk and a device.
D	Derivative time or rate time is the time constant of derivative control expressed in seconds. A value of zero disables derivative action.

Damping Coefficient	The valve response may be made slower for some applications. A value of 0 gives no damping, and a value of 9 gives maximum damping of valve motion.
Data Link Layer (DLL)	This controls transmission of messages onto the fieldbus, and manages access to the fieldbus through the Link Active Scheduler (LAS). The DLL used by FOUNDATION Fieldbus is defined in IEC 61158 and ISA S50. It includes Publisher/Subscriber, Client/Server and Source/Sink services.
DD	See Device Description
Dead Zone(%)	When the valve position is within the setpoint +/- the dead zone, no additional position control occurs. This value is normally 0%, however for high friction valves (e.g. valves with graphite packing) a higher dead zone helps avoid limit cycling due to the stick/slip action of the valve. In these cases the dead zone chosen might be 0.2% to 1%.
Decimal	Notation for numbers to base 10. The number sequence is 0,1...9.
Device Description (DD)	This provides an extended description of each object in the Virtual Field Device (VFD), and includes information needed for a control system or host to understand VFD data meaning.
DI Digital Input Block Dialog	This is the term for a screen that allows you to interface with the software application.
DLL	Dynamic Link Library in Windows. DLL files are installed when installing NIFB software and ValVueFF software.
FAS Fieldbus Access Sublayer	A Fieldbus is a digital, two-way, multi-drop communication link among intelligent measurement and control devices. It serves as a Local Area Network (LAN) for advanced process control, remote input/output and high speed factory automation applications.
Fieldbus Access Sublayer (FAS)	The Fieldbus Access Sublayer (FAS) maps the Fieldbus Message Specification (FMS) onto the Data Link Layer (DLL).
Fieldbus Messaging Specification (FMS)	This contains definitions of Application Layer services in FOUNDATION Fieldbus. The FMS specifies services and message formats for accessing Function Block (FB) parameters, as well as Object Dictionary (OD) descriptions for those parameters defined in the Virtual Field Device (VFD).
Flash Memory	A computer memory which is not volatile. It stores all its data even when the power is off. It performs high speed reads and may be re-written many times. It is used to store programs and permanent parameters.

Flexible Function Block	This is similar to a Standard FB, except that the function of the block, the order and definition of the block parameters, and the time required to execute the block are determined by an application-specific algorithm created by a programming tool. Flexible Function Blocks (FBs) are typically used for control of discrete processes and for hybrid (batch) processes. A Programmable Logic Controller (PLC) can be modeled as a Flexible Function Block device.
FMS Fieldbus Messaging Service Frame	A defined area in the Windows dialog that groups related data.
H1	H1 is a term used to describe a fieldbus network operating at 31.25 kbit/second.
H1 Field Device	This is a fieldbus device connected directly to an H1 fieldbus. Typical H1 Field Devices are valves and transmitters.
H1 Repeater	This is an active, bus-powered or non-bus-powered device used to extend the range over which signals can be correctly transmitted and received for a given medium. A maximum of four Repeaters and/or active Couplers can be used between any two devices on an H1 fieldbus network.
Hazardous Area	The area of the plant where explosion hazards can be present, hazards such as propane gas in a refinery, or dust in a flour mill.
Hexadecimal	Notation for numbers to base 16. The number sequence is 0,1...9, a, b, c, d, e, f to represent decimal 0 to 16. Customarily hexadecimal notation is identified with the preamble 0x.
High Speed Ethernet (HSE)	This is the Fieldbus Foundation's backbone network running at 100 Mbit/seconds.
Hot swappable	The FVP in combination with ValVueFF enables a very brief Mean Time To Repair by the following process: Upload all configuration information from installed positioner to ValVueFF, then replace the positioner and download the configuration file. Run STOPS, and autoTUNE, and the repair is complete.
HSE Field Device	This is a fieldbus device connected directly to a High Speed Ethernet (HSE) fieldbus. Typical HSE Field Devices are HSE Linking Devices, HSE Field Devices running Function Blocks (FBs), and Host Computers.
HSE Linking Device	This is a device used to interconnect H1 fieldbus Segments to High Speed Ethernet (HSE) to create a larger network.
HSE Switch	This is standard Ethernet equipment used to interconnect multiple High Speed Ethernet (HSE) devices such as HSE Linking Devices and HSE Field Devices to form a larger HSE network.

HTML Hyper Text Markup Language	The standard language for Web Browsers is platform independent.
I	Integral time or reset time, is the time constant of integral control. Higher values of I cause slower integral action. A value of zero disables integral action.
I/P Converter	The electro-magnetic device which converts low energy electrical current signal to a pressure which is then amplified by the pneumatic relay.
IMan	Initialization manual mode
Initialization	When a downstream block is not responding to it's setpoint an upstream block adjusts its output so that it is at the correct value when the downstream block returns to a mode responsive to its setpoint. This provides bumpless transfer for mode changes. See Foundation Fieldbus specifications.
Input/Output (I/O) Subsystem Interface	This is a device used to connect other types of communications protocols to a fieldbus Segment or Segments.
Interchangeability	This is the capability to substitute a device from one manufacturer with that of another manufacturer on a fieldbus network without loss of functionality or degree of integration.
Interoperability	This is the capability for a device from one manufacturer to interact with that of another manufacturer on a fieldbus network without loss of functionality.
IRQ	Interrupt Request. This is a resource that must be properly assigned when the NIFBUS inter face card drivers are installed in Windows.
ISA	The Instrument Society of America. ISA develops and publishes international standards for use in process control. See www.isi.org
Link	This is the logical medium by which H1 Fieldbus devices are interconnected. It is composed of one or more physical segments interconnected by bus Repeaters or Couplers. All of the devices on a link share a common schedule which is administered by that link's current LAS.
Link Active Scheduler (LAS)	A Link Active Scheduler (LAS) is a deterministic, centralized bus scheduler that maintains a list of transmission times for all data buffers in all devices that need to be cyclically transmitted. Only one Link Master (LM) device on an H1 fieldbus Link can be functioning as that link's LAS.

Link Master (LM)	A Link Master (LM) is any device containing Link Active Scheduler (LAS) functionality that can control communications on an H1 fieldbus Link. There must be at least one LM on an H1 Link one of those LM devices is elected to serve as LAS.
Link Object	A Link Object contains information to link Function Block (FB) Input/Output (I/O) parameters in the same device and between different devices. The Link Object links directly to a Virtual Communications Relationship (VCR).
Links	Linkages Foundation fieldbus creates a link between two function blocks to manage the scheduled communication of data between them for control. The link information is stored in a Link Object.
LO	Local Override mode
MAN	Manual mode
MIB	Management Information Base
Multidrop	A variation of the HART Communications Protocol which allows many smart field devices to draw power from, and to communicate over a single pair of wires. Though most suited to multiple measurement devices, it can be used with FVP to permit digital communication of set point as well as configuration data, to multiple positioners or a combination of positioners and measurement transmitters. Such communication may not be fast enough for flow control.
NAMUR	NAMUR is a European user association of process control technology in chemical and pharmaceutical industries. "Recommendations and Worksheets are experience reports and working documents prepared by NAMUR for its members among process control users for facultative utilization". NAMUR issued a recommended accessory mounting for control valves (NE 14 Anschluß von Schwenkantrieben an Armaturen 06.08.96) which describes a method for mounting a positioner on an actuator. See more at www.namur.de
Network Management (NM)	Network Management (NM) permits FOUNDATION Network Manager (NMgr) entities to conduct management operations over the network using Network Management Agents (NMAs). Each Network Management Agent (NMA) is responsible for managing the communi cations within a device. The NMgr and NMA communicate through use of the Fieldbus Messaging Specification (FMS) and Virtual Communications Relationship (VCR).
Non-Volatile Memory	Computer memory which is not lost when power is turned off. Used to permanently store calibration, configuration and diagnostic information in FVP.
Normal State	The normal set of target modes for the function blocks

Object Dictionary	An Object Dictionary (OD) contains all Function Block (FB), Resource Block (RB) and Transducer Block (TB) parameters used in a device. Through these parameters, the blocks can be accessed over the fieldbus network.
OOS	Out of Service mode
Out of Service State	The FVP positioner transducer, resource and Analog Output, PID blocks are in Out of Service mode.
P	This is a dimensionless gain factor related to the proportioning action of the algorithm. It ranges from 0 to 5000. Common values for the positioner are 50 for small valves up to 4000 for large valves.
Parameter	The data objects in Foundation Fieldbus are identified in the form of TAG.PARAMETER. Each data object is a parameter that can include many elements such as an array, or a value and a status. Elements of a parameter are referred to by sub-index.
PC	As used in this manual, a personal computer or laptop running under Windows 2000, Windows Server 2003 or XP operating system.
Physical Layer	The Physical Layer receives messages from the Communications Stack and converts the messages into physical signals on the fieldbus transmission medium, and vice- versa.
PID	Proportion Integral Derivative Control Block
Position	With a reciprocating valve, the position is the distance of the plug from its seat, normally measured as a linear motion of the valve or actuator stem. With a rotary valve, the position is the angle of rotation of the valve plug measured as angular rotation of the valve shaft.
Position Limit	The Actuator can be mechanically set to stop at a predetermined position by setting an adjustment, sometimes with a handwheel or screw stop. FVP can be configured to provide the same limits through software control of position.
Position, Valve	With a reciprocating valve, the valve position is the distance of the plug from its seat, normally measured as a linear motion of the valve or actuator stem. With a rotary valve the position is the angle of rotation of the valve plug measured as angular rotation of the valve shaft.
Positioner Tuning Parameters	The positioner requires six integer parameters to determine the response of the positioner to a setpoint change. Internally, the positioner uses an improved PID control algorithm to control the valve position.

Quick Opening	(see Characteristic)
RB	Resource Block
RCAS	Remote Cascade mode
Relay, Pneumatic	The component which amplifies the pneumatic control signals to provide a wide range of actuation pressure and to supply and vent at high flow rates for responsive control.
Resource Block (RB)	This describes fieldbus device characteristics, such as the device name, manufacturer and serial number. There is only one Resource Block (RB) in a device.
ROUT	Remote output mode
Safe Area	The area of a plant where there never is an explosion hazard present, such as the control room or a wire marshalling rack area.
Schedules	This defines when Function Blocks (FBs) execute and when data and status is published on the bus.
Segment	This is a section of an H1 fieldbus that is terminated in its characteristic impedance. Segments can be linked by Repeaters to form a longer H1 fieldbus. Each Segment can include up to 32 H1 devices.
Single Acting	The action of a position with a single pneumatic output for operation with a spring return actuator. (see double acting).
SMIB	System Management Information Base
Splice	This is an H1 spur measuring less than 1 m (3.28 ft.) in length.
Split Range	A control configuration in which a single control output is sent to two or more control valves. Each control valve positioner is calibrated to respond to a separate portion of the control signal. For example, a steam valve and a cooling water valve arranged to be both closed at 50% and the steam valve to open
Spur	This is an H1 branch line connecting to the trunk that is a final circuit. A spur can vary in length from 1 m (3.28') to 120 m (394').
Standard Function Block (FB)	These are built into fieldbus devices to achieve the desired control functionality. Automation functions provided by Standard FBs include Analog Input (AI), Analog Output (AO) and Proportional/ Integral/Derivative (PID) control. The Fieldbus Foundation has released specifications for 21 types of Standard FBs. There can be many types of FBs in a device. The order and definition of Standard FB parameters are fixed and defined by the specifications.

STOPS FVP	The FVPI runs the STOPS procedure to adjust the positioner to actual valve travel. First the output pressure is reduced to zero, and the position is recorded. That is the position corresponding to 0%. The output pressure is raised to its maximum (based on supply pressure). The position is recorded and corresponds to 100%.
Stroke	The total range of valve travel. Often used as a verb to describe the process of moving the valve.
System Management (SM)	This synchronizes execution of Function Blocks (FBs) and the communication of Function Block (FB) parameters on the fieldbus, and handles publication of the time of day to all devices, automatic assignment of device addresses, and searching for parameter names or *tags* on the fieldbus.
Tag	The formal designator the control valve used in control loop documentation.
TB	Transducer Block
Terminator	This is an impedance-matching module used at or near each end of a transmission line. Only two Terminators can be used on a single H1 segment.
Tight Shutoff (TS)	A positioner property that is selected and adjusted when it is desired to prevent operation of the valve at or near the closed position. The positioner causes all available actuator force to be applied to the valve seat at a position set point equal to or less than the TS adjustable parameter. A dead band is applied to prevent cycling in and out of this behavior.
Transducer Block (TB)	This decouples Function Blocks (FBs) from the local Input/Output (I/O) functions required to read sensors and command output hardware. Transducer Blocks (TBs) contain information such as calibration date and sensor type. There is usually one TRANSDUCER BLOCK (TB) channel for each input or output of a Function Block (FB).
Transmitter	This is an active fieldbus device, usually sensing a physical variable, containing circuitry which applies a digital signal on the bus.
Trunk	This is the main communication highway between devices on an H1 fieldbus network. The Trunk acts as a source of main supply to network spurs.
Unit Index	Engineering units in Foundation fieldbus are represented by an index number, to eliminate confusion. Only listed units with an assigned unit index are used in function blocks. ValVueFF always shows the text representation of the unit index.

User Application	This is based on *blocks*, including Resource Blocks (RBs), Function Blocks (FBs) and Transducer Blocks (TBs), which represent different types of application functions.
User Layer	This provides scheduling of Function Blocks (FBs), as well as Device Descriptions (DDs), which allow the host system to communicate with devices without the need for custom programming.
ValVueFF	The full featured Masoneilan software for diagnostics, calibration, and configuration

Launching from Yokagawa and Emerson

B

This section describes how to launch the FF application using the Yokagawa PRM software and the Emerson Delta V Snap-On.

Launching from Yokagawa PRM

To launch from Yokagawa:

1. Select **Start > All Programs > Yokagawa PRM > Plant Resource Manager** or click the icon and Figure 164 appears.

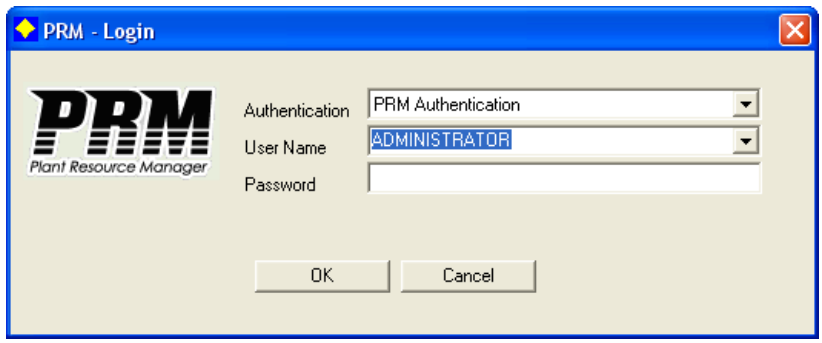

Figure 164 PRM - Login Dialog

2. Enter the password and click **OK** and the *Plant Resource Manager* main screen appears (Figure 165).

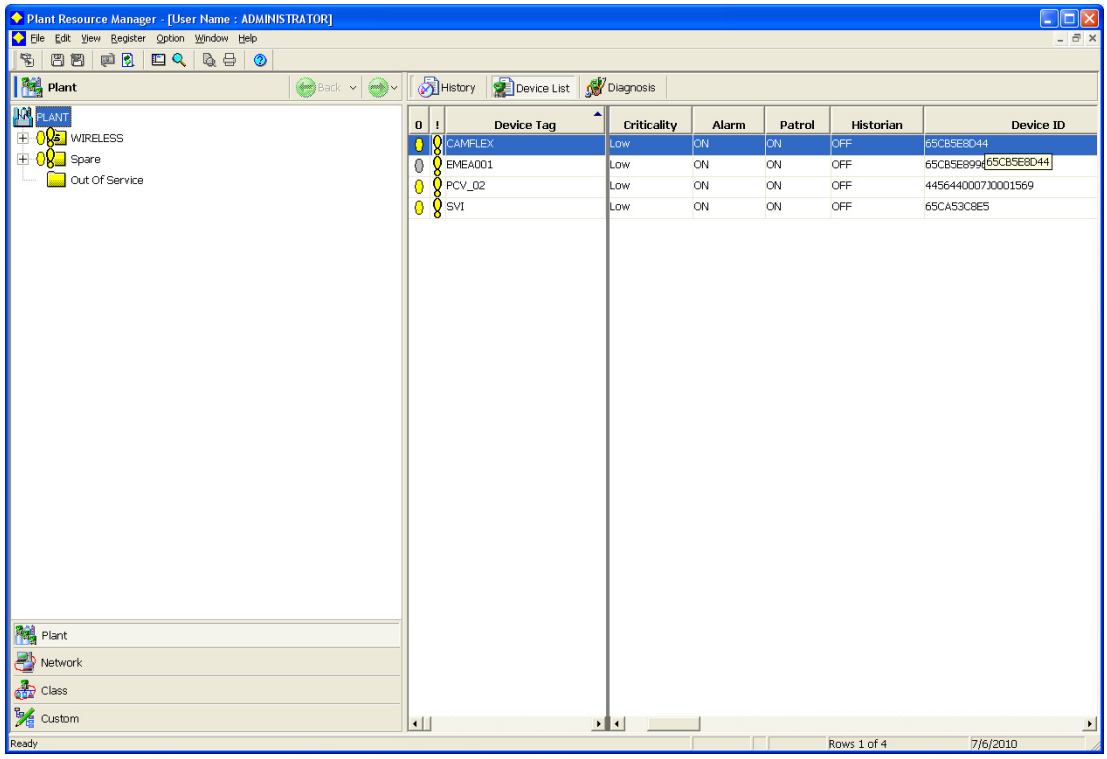

Figure 165 PRM Main Screen

3. Double-click on the **Device Tag** and the screen populates with the information (Figure 166).

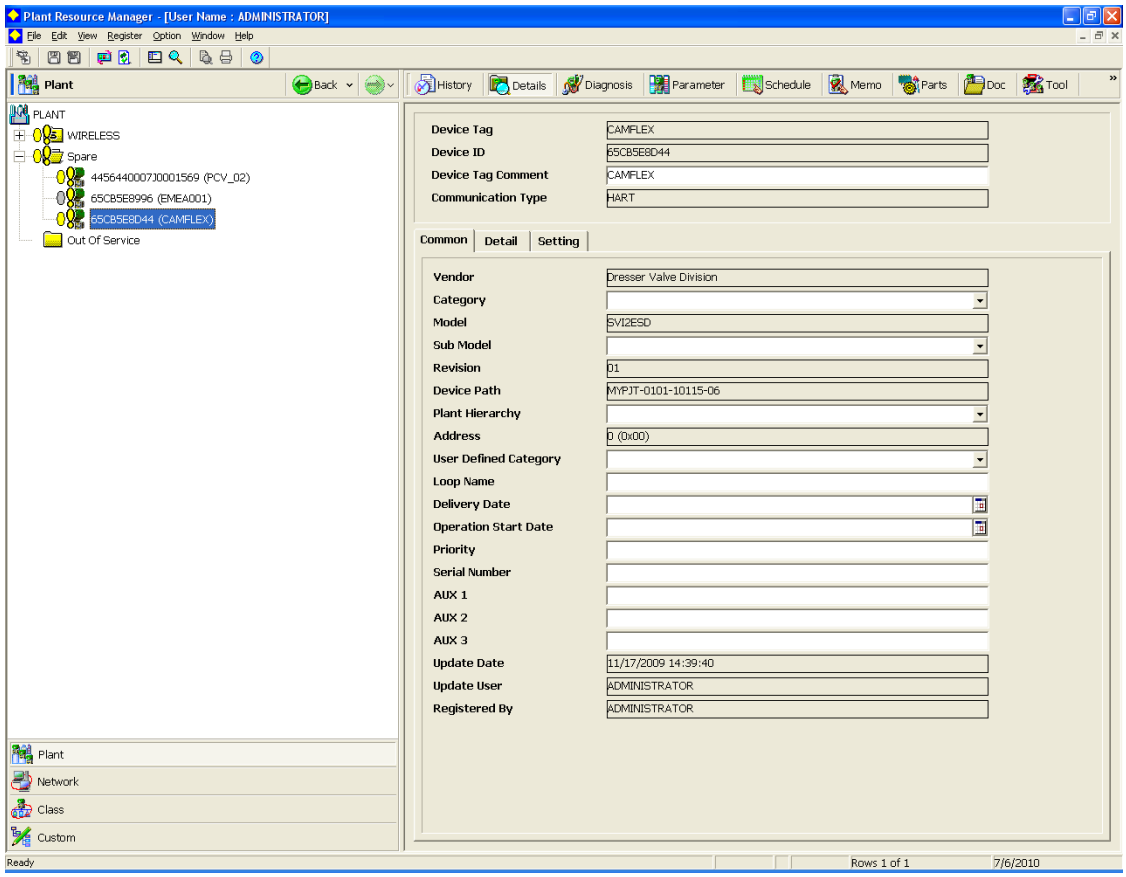

Figure 166 PRM Main Screen Populated

4. Select the valve and click in the arrows and select **PUG-IN** (Figure 167) and the screen changes to (Figure 168).

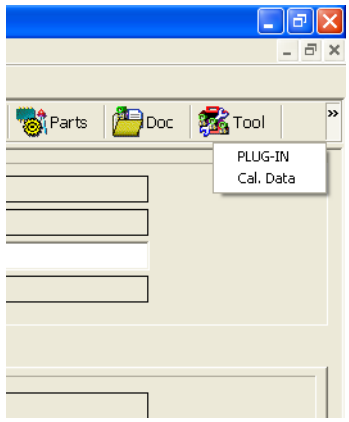

Figure 167 PLUG-IN Selection

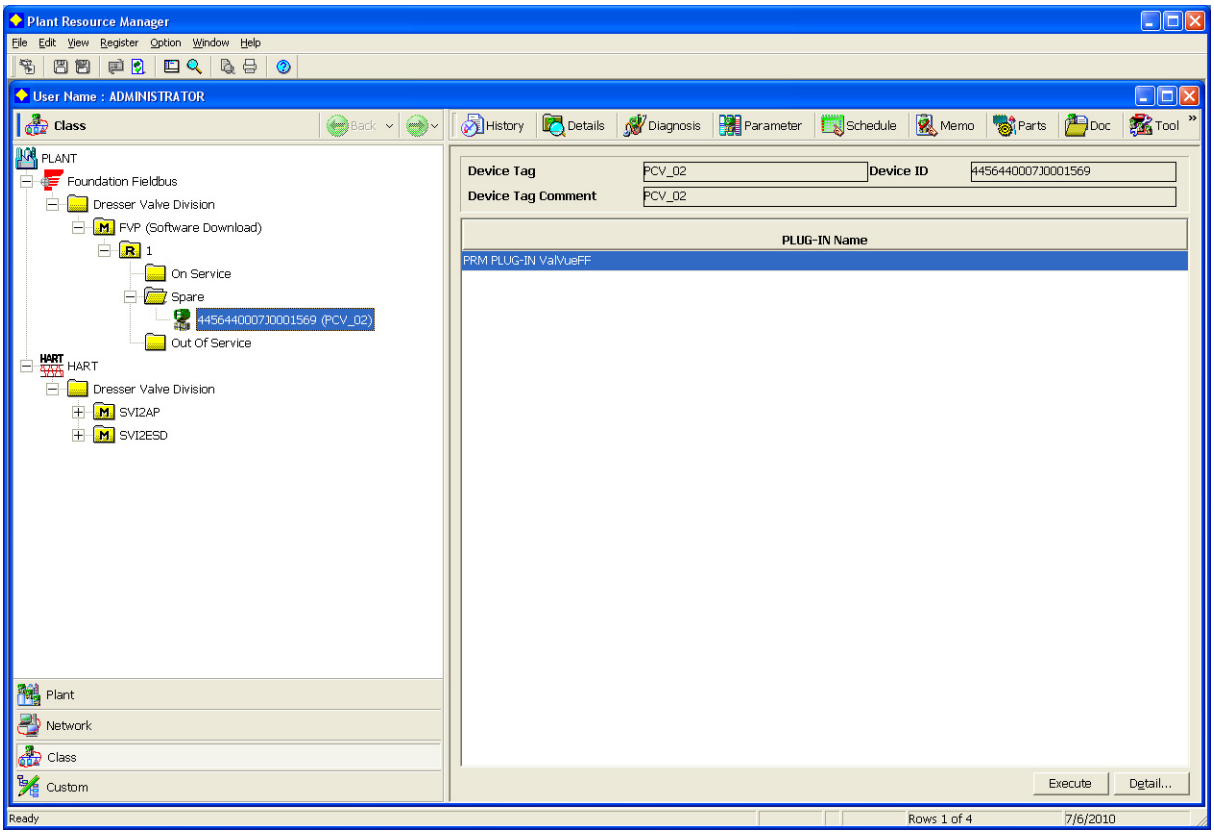

Figure 168 PRM Main Screen Valve Selected

5. Double-click the **Plug-In Name** and the *PRM PLUG-IN ValVueFF Login* screen appears.

6. Enter the *Username* and Password and click **OK** and the *Open Device Dialog* appears followed by the main screen (Figure 169).

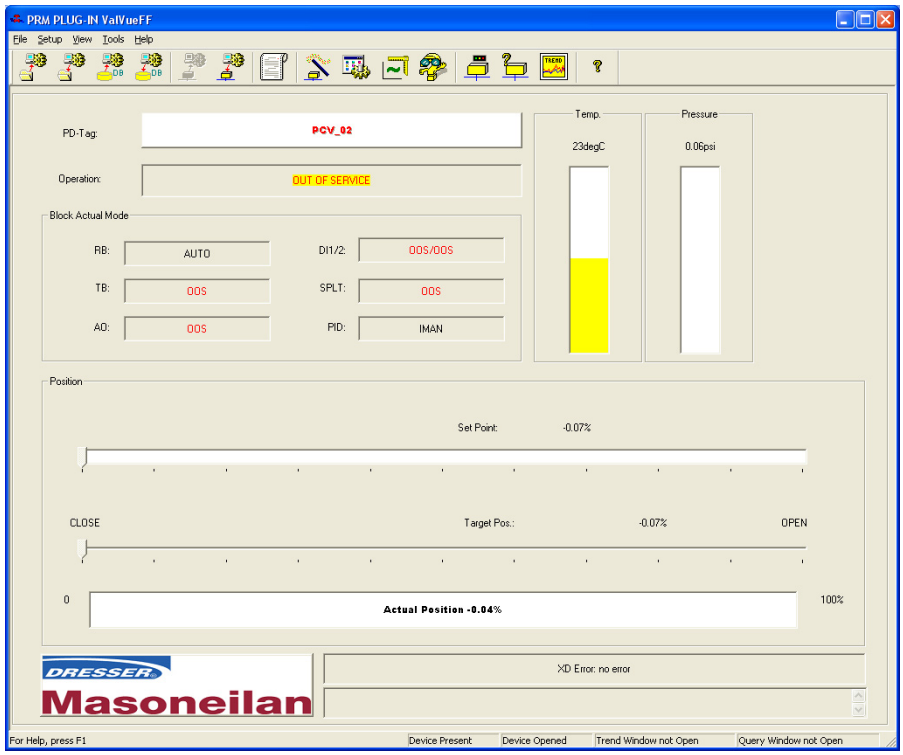

Figure 169 PRM Plug In ValVueFF Main Screen

Emerson Delta V Snap-On

To launch from Emerson:

1. Select **Start > All Programs > AMS Device Manager > AMS Device Manager** or the icon

and the window appears (Figure 170).

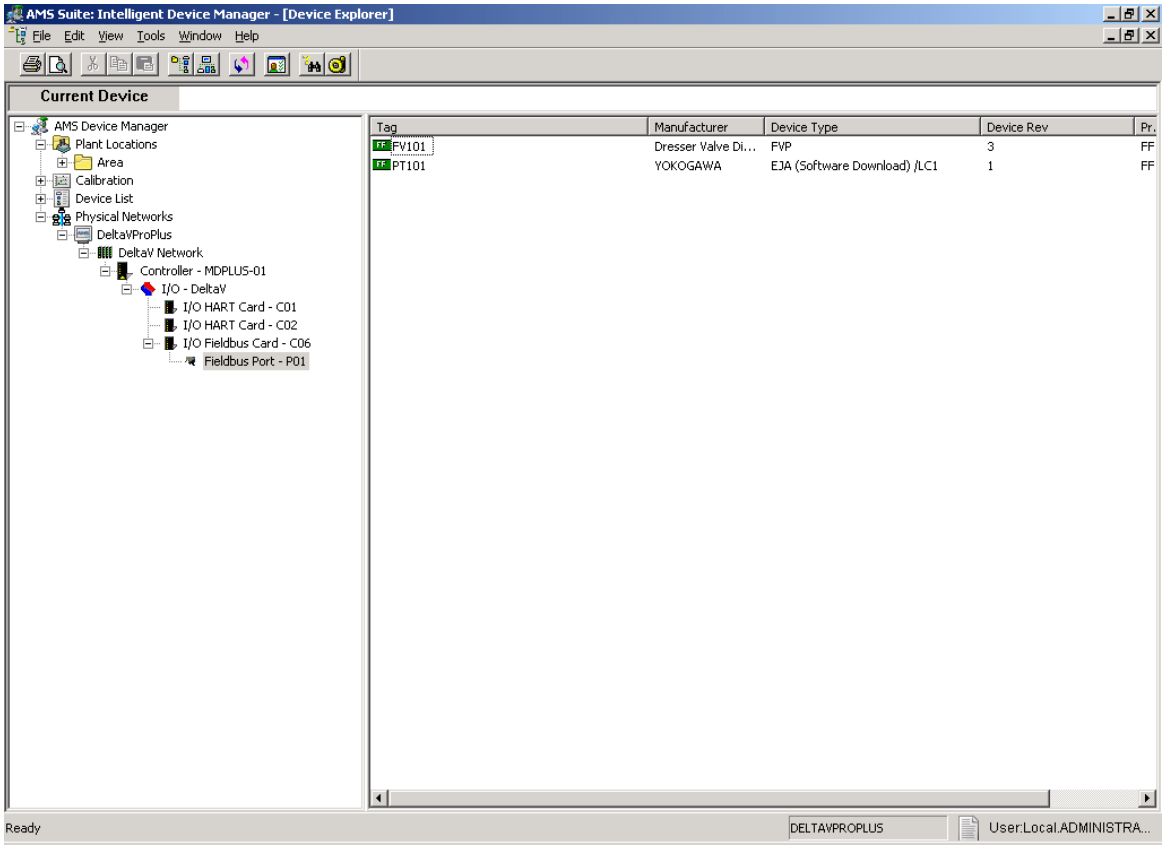

Figure 170 AMS Suite Intelligent Device Manger Window

2. Navigate to the correct valve and select the FVP.
3. Double-click the tag and a search dialog appears (Figure 171).

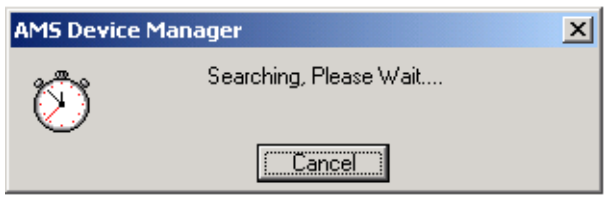

Figure 171 Searching Dialog

A dialog appears (Figure 172) as parameters are read.

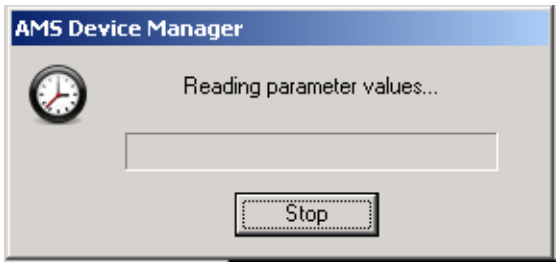

Figure 172 Reading Parameters Dialog

The main screen appears (Figure 173).

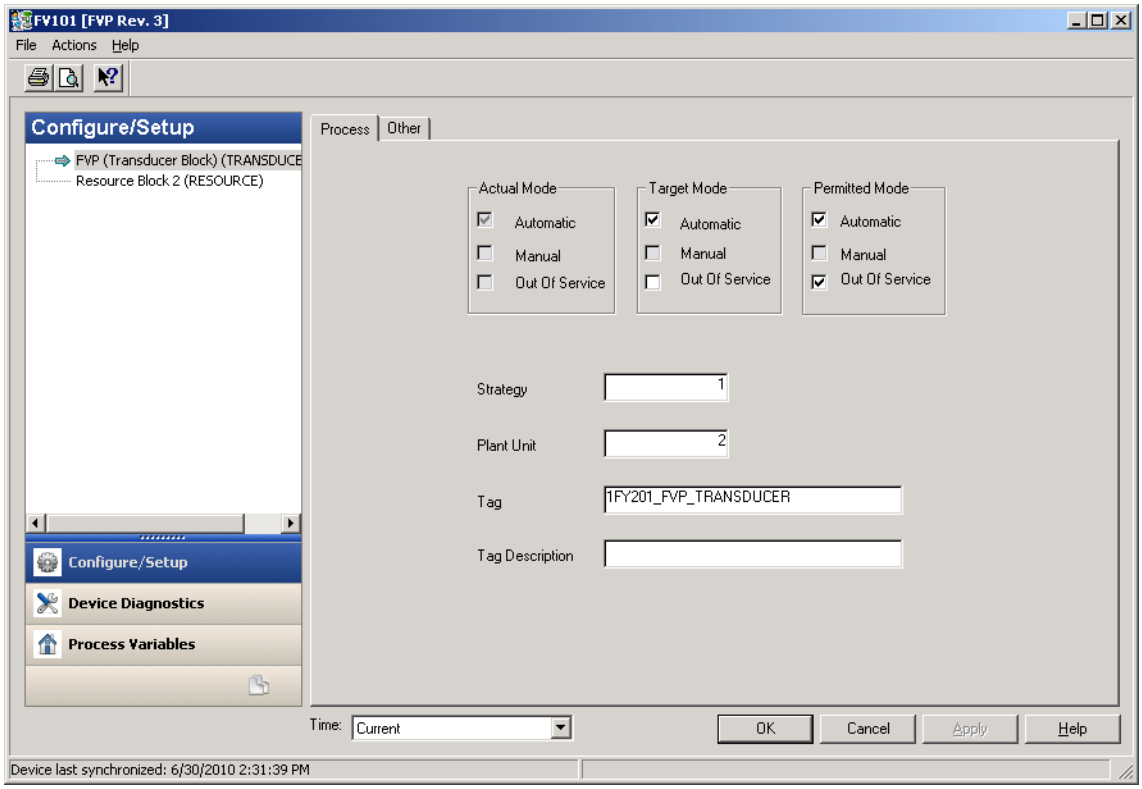

Figure 173 FVP for PRM Main Screen

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Configuring DI to TB

C

There are two Discrete Input Blocks (DI) in FVP, used to communicate the state of internal, software, limit switches. The Discrete Input Blocks (DI) modes appear in IVI and the internal variables are viewed with the Query service.

To activate a Discrete Input Blocks (DI):

1. Schedule each block.
2. Link each block, optional.
3. Configure the block to the correct Transducer Block (TB) channel. In a fieldbus configurator, set the DI channel configurator. Assign channel two to the High Limit switch DI1 and channel three to the Low Limit switch, DI2.

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Installing the Interface Board

D

Installing the Interface Board

This process consists of:

1. “Installing the NI-FBUS Software”.
2. Either:
   - ❑ “Installing the PCMCIA Card”

   or
   - ❑ “Install the USB-8486” on page 204

Installing the NI-FBUS Software

To install the NI-FBUS software:

CAUTION

If you are reinstalling the NI-FBUS software over a previous version, write down your card configuration and any port configuration parameters you changed from their defaults. Reinstalling the software may cause you to lose any existing card and port configuration information.

1. Log in as Administrator or as a user that has Administrator privileges.
2. Insert the *NI-FBUS Software for Windows* CD into the CD-ROM drive. If the installer does not launch automatically, navigate to the CD using Windows Explorer and launch the autorun.exe.
3. The setup program steps you through the software install.
4. Restart the computer when the setup completes.

Installing the PCMCIA Card

To install the card:

CAUTION

Before you remove the card from the package, touch the antistatic plastic package to a metal part of the system chassis to discharge electrostatic energy.

1. Power on the computer.
2. Insert the card into a free PCMCIA (or Cardbus) socket. The card has no jumpers or switches to set.
3. Connect the PCMCIA-FBUS to the Fieldbus network using a PCMCIA-FBUS cable.

NOTE

*If this card has been installed previously changes are required. Remove the board using the device manager. Reinstall the board using Add/New Hardware wizard in the Control Panel. Use the NI-FBUS Interface Configuration Utility to install the board and observe or change the IRQ and memory base address. This is not recommended. Select the board and select **Edit** to open the interface dialog box.*

Install the USB-8486

CAUTION

Operate the USB-8486 only as described in the operating instructions. Do not unplug the USB-8486 when the NI-FBUS software is running.

To install the USB-8486, complete the following steps.

1. Power on the computer.
2. Plug the USB connector into a USB port on your computer and the DB9 connector into the USB-8486.
3. Connect the USB-8486 to the Fieldbus network. Refer to the NI-FBUS Hardware and Software User Manual for more information about the connectors.
4. Launch the Interface Configuration Utility.
5. Right-click the USB-8486 and select **Enable**.
6. Close the Interface Configuration Utility and start the NI-FBUS Communications Manager or NI-FBUS Configurator.

Replacing an FVP Configuration

E

Replacing an FVP Configuration

To replace an FVP:

1. Connect to the original, source, device using ValVueFF.
2. Upload the Configuration to a file.
3. Save the file using a meaningful name.
4. Select **OFFLINE** from the device tree.
5. Open the saved file.
6. Select **Download Config**.
7. Select a target device from the list box.

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Error Messages

F

Auto Tune Results

Table 16 Auto Tune Results

Reference	Message	Possible Cause
1	Succeeded	
2	Canceled	Operator selected cancel
21	Exhaust air pressure warning	
22	Small air supply pressure warning	
23	Large air supply pressure warning	
40	Offset drift warning	
42	Large response speed warning	
43	Large hysteresis warning	
44	Large slip width warning	
60	Small angle span warning	The position is incorrectly configured as rotary on a linear, reciprocating, valve.
61	Large angle span warning	The position is incorrectly configured as linear reciprocating on a rotary valve.
62	Fifty percent angle warning	At mid-scale the position sensor angle is greater than 15° from horizontal.
100	Small angle span error	
101	Large angle span error	

Table 16 Auto Tune Results (Continued)

Reference	Message	Possible Cause
102	Fifty percent angle error	
103	Linear adjust error	
120	Offset measurement failed error	
121	Gain measurement failed error	
122	Response speed measurement failed error	
123	Hysteresis measurement failed error	
255	In operation (executing)	

Online Diagnostics

The results of online diagnostics are shown in the parameter *XD_ERROR* and explained in Table 17. Other diagnostic messages applicable to internal circuits, memory failure for example, are reported in the Resource Block.

Table 17 Error Messages

XD Error	Message	Possible Cause
0	No error	
100	Cycle count limit exceeded	TOTAL_CYCLE_COUNT exceeded CYCLE_CONT_LIM
101	Travel limit exceeded	TOTAL_TRAVEL exceeded TRAVEL_LIM
102	Total open limit exceeded	TOTAL_OPEN_TIME exceeded OPEN_TIME_LIM
103	Total close limit exceeded	TOTAL_CLOSE_TIME exceeded CLOSE_TIME_LIM
104	Total near close limit exceeded	TOTAL_NEAR_CLOSE_TIME exceeded NEAR_CLOSE_TIME_LIM
110	Temperature out of range	
111	Pressure sensor out of range	
112	Position sensor out of range	
113	Deviation warning	Exceed the first DEVIATION_TIME_TH[1] timer with DEVIATION_LIM

Table 17 Error Messages (Continued)

XD Error	Message	Possible Cause
120	Temperature sensor failure	
121	Pressure sensor failure	
122	Operation drift point warning	
123	Deviation error	Exceed the seconds DEVIATION_TIME_TH[2] timer with DEVIATION_LIM
124	Position failure	
125	A-D converter failure	

Block Error

Table 18 lists parameters that reflect the error status associated with hardware or software components associated with the list block. The error parameter is a bit string, multiple errors can be displayed.

Table 18 Error Bit Strings

Block Error Bit Position	Error
Resource block RB_BLOCK_ERR	
bit 3	Simulate Active **
bit 5	Default Fault State
bit 10	Lost Static Data
bit 11	Lost NV Data
bit 13	Device Needs Maintenance Now
bit 15	Out of Service
Transducer block TB.BLOCK_ERR	
bit 0	Other
bit 15	Out of Service
bit 3	Simulate Active **
bit 4	Local Override
bit 7	Input Failure-process variable has BAD status
bit 15	Out-of-Service
Discrete input block DI.BLOCK_ERR	

Table 18 Error Bit Strings (Continued)

Block Error Bit Position	Error
bit 3	Simulate Active **
bit 7	Input Failure-process variable has BAD status
bit 15	Out of Service
PID controller block PID>BLOCK_ERR	
bit 7	Input Failure-process variable has BAD status
bit 15	Out of Service

Foundation Fieldbus

G

Overview

This section introduces a process example and several concepts used throughout the manual. It briefly introduces Foundation Fieldbus blocks and some of the essential block concepts. The process example is a heat exchanger (Figure 174) with two control valves and three measurement devices. The controls are configured in a cascade arrangement to illustrate concepts of transfer between modes and states of the various levels of control.

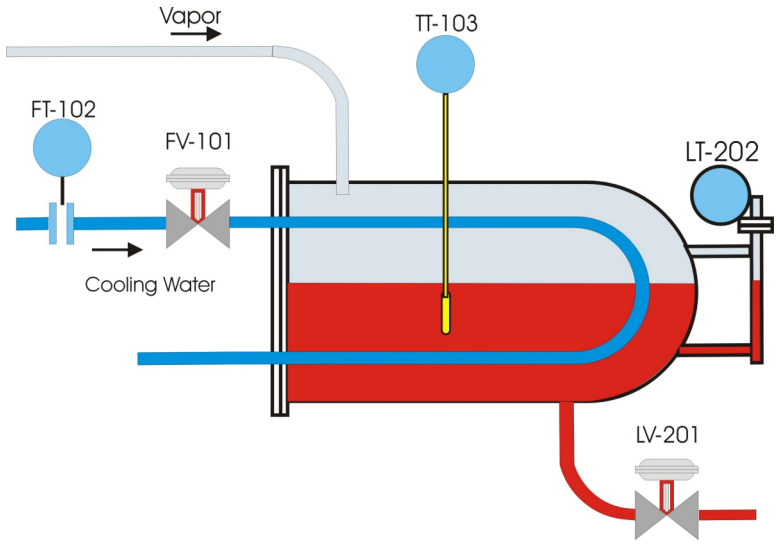

Figure 174 Heat Exchanger

Reference Model Process

The Heat Exchanger model, shown in Figure 174, is not a practical example but it does incorporate elements that illustrate important ValVueFF features. Each module has a device tag used for ValVueFF identification. The process consists of a vessel with a product vapor inflow that is condensed and flows out as a liquid outflow. The tank level is controlled by an outflow control valve, LV 201. The tank contents are chilled by coolant water. The temperature is controlled by a temperature controller cascaded to a flow controller. The coolant flow is controlled by control valve FV 101.

P&I D

Figure 175 shows, in schematic form, the physical devices and indicates the measurement and control functions that reside in each device:

- ❑ The coolant flow transmitter, FT 102, has only a transmitter function.
- ❑ The coolant flow control valve, FV 101, has a PID control: two DI blocks and an Analog Output Block (AO) all located within the FVP valve positioner.
- ❑ The flow of control information between devices is indicated by dashed lines.
- ❑ The DI blocks, ZSL 101 and ZSH 101, serve as low and high stem position limit switches, respectively. The DI blocks, ZSL 201 and ZSH 201, serve as low and high stem position limit switches, respectively.
- ❑ Liquid level is controlled by a remote controller LC201 to demonstrate Remote Cascade operation.
- ❑ The controller receives the process measurement from level transmitter LT 202. The PID control regulates the valve LV201, an FVP positioner with an Analog Output Block, and 2 DI function blocks.

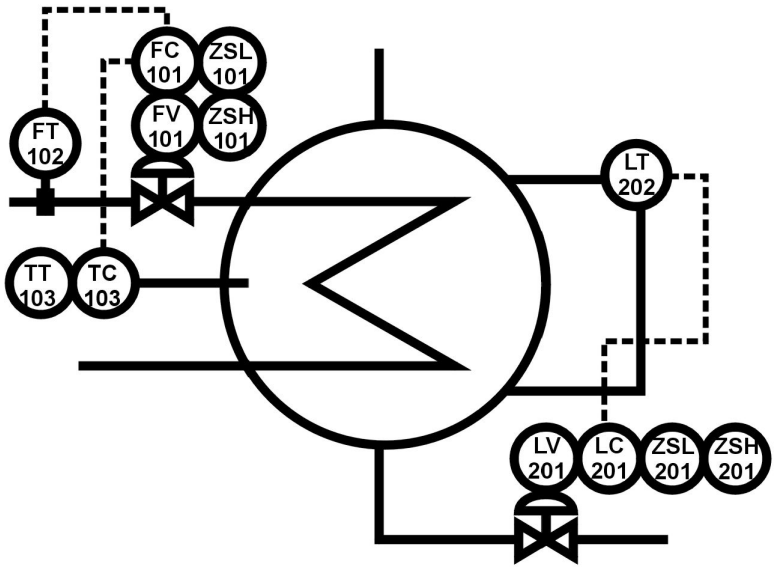

Figure 175 Piping and Instrumentation Diagram

Function Block Links

Each of the control functions is represented in the Control configuration as Foundation Fieldbus function blocks. All the blocks in the temperature cascade are shown in Figure 176.

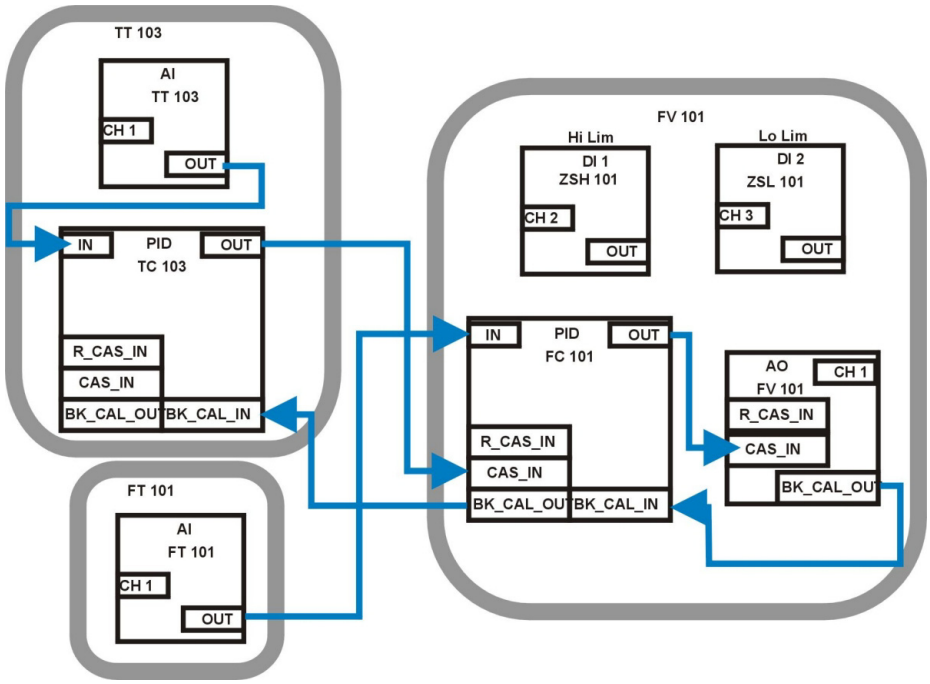

Figure 176 Temperature Cascade Block Diagram

They are grouped according to the physical device containing them and they are shown with the links between the blocks, soft wiring for data flow. Similarly, the level loop function blocks are shown in Figure 177.

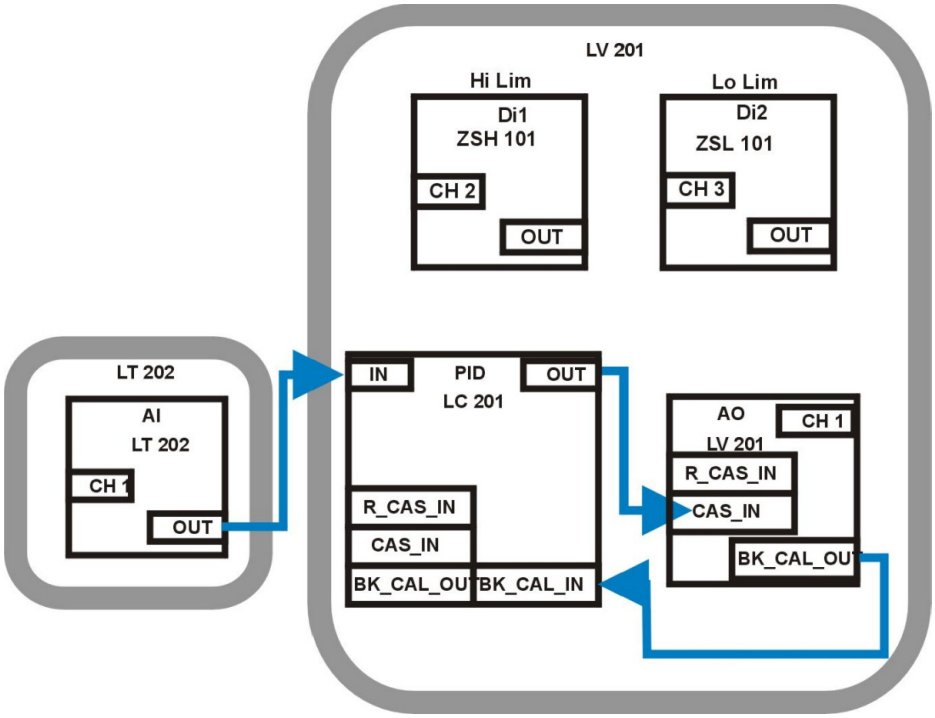

Figure 177 Level Loop Block Diagram

To complete the model ValVueFF (Figure 178) is temporarily connected to the heat exchanger's Foundation Fieldbus wiring at an intermediate point.

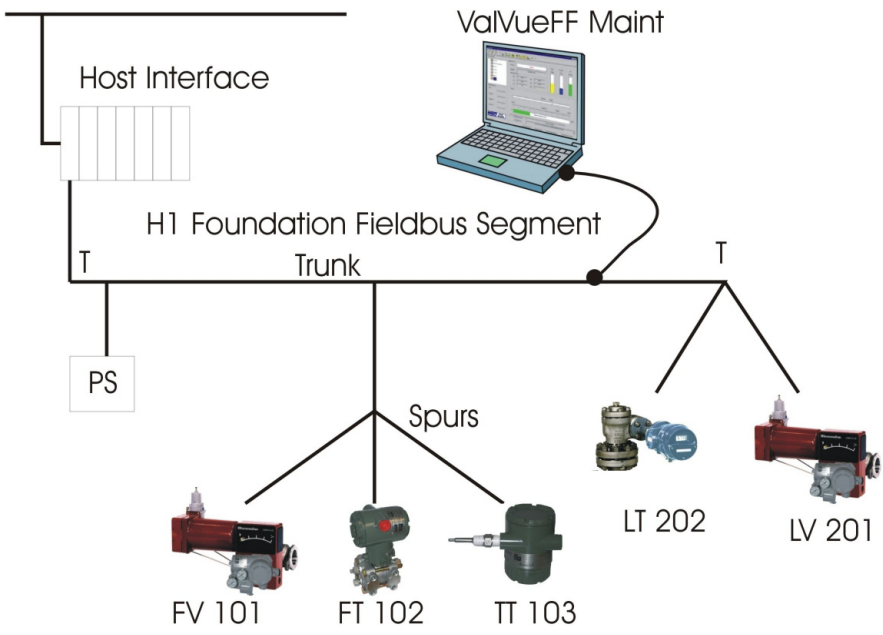

Figure 178 ValVueFF Connected as a Visitor Device

The Heat Exchanger Reference Model segment consists of a Heat Exchanger Host in a control center with a Foundation Fieldbus trunk connected to two junction boxes. One junction box has spurs to the flow and temperature control devices and the other connects to the devices controlling tank level. A power supply with isolation electronics and two terminators completes the configuration. Configure the ValVueFF maintenance computer interface cards (NIFBUS) so as to not interfere with the Heat Exchanger Host.

CAUTION

Never connect a ValVueFF PC to an operating segment unless it is configured as a Basic Device. See Figure 175 to view the configuration options.

Do not cause a short circuit in a working segment while connecting or disconnecting any device.

Device Operational States and Block Modes

The Operation State can be accessed several ways:

- ❑ From the *Device Selection* frame, right-click the device to pop up a menu list and select **Device Operation State**.
- ❑ Select the icon.
- ❑ Select **Tools > Device Operation State** from the Menu bar.

The *Device Operation Dialog* appears (Figure 179) and offers a choice of *Out Of Service, Manual* or *Normal (Automatic)* states.

Figure 179 Device Operation State Dialog Box

ValVueFF manages the operational states of the positioner and its embedded PID controller by controlling the target modes for each of the function blocks. The actual mode of each block can be different from the target mode. The actual mode is controlled by the block itself in accordance with mode rules based on the quality of the data and modes of the linked blocks. A brief summary of modes follows, a thorough discussion of modes is beyond the scope of this instruction manual. You can refer to the Fieldbus Foundation that specifies the formal rules for mode changing.

Three operational states are set by ValVueFF (Figure 179) Out Of Service (OOS) Forces all of the blocks to Out Of Service Mode. The outputs remain at the values prior to the state change. All output calculation is suspended. Back calculation values are passed to other linked blocks to enable initialization. The PID block remains in OOS after configuration changes unless it is put into one of its allowed modes from the PID dialog box. The PID dialog box can be started from the *Device Operation Dialog* box.

Block Modes

All blocks (function/transducer/resource) have operating modes. There are eight modes defined in the Foundation Fieldbus specification. Not all modes are supported by every block. For example, the Discrete Input Block (DI) supports Auto, Man and OOS. The action of the modes are described in the following paragraphs. Transfers between modes are managed by the function blocks in response to manual commands that in turn responded to changes in the modes of linked blocks and responded to changes in the quality of the parameters that are transmitted. Control and status options can be set to manage mode changing behavior.

Remote-Output (Rout)	The block output is set by a control application running on an interface device through the remote-output-in parameter. The algorithm is bypassed and the remote block controls its output directly. The algorithm must initialize so that no bump is experienced when the mode switches to Auto. A remote-output-out parameter is maintained by the block to support initialization of the control application when the block mode is not remote- output. The Set Point can be maintained or initialized to the process variable value.
Remote-Cascade (RCas)	The block Set Point is set by a control application running on an interface device through the remote-cascade in parameter. Based on this Set Point the normal block algorithm determines the primary output value. A remote-cascade out parameter is maintained by the block to support initialization of the control application when the block mode is not remote-cascade.
Cascade (Cas)	A Set Point value supplied by another function block through the Cascade input parameter is used by the normal block algorithm in determining the primary output value. This connection between function blocks is defined by a link object.

Automatic (Auto)	A local Set Point value is used by the normal block algorithm in determining the primary output value. The local Set Point value can be written to by an operator through an interface device.
Manual (Man)	The block output is not being calculated, although it can be limited. It is directly set by the operator through an interface device. The algorithm must initialize so that no bump is experienced when the mode switches. The Set Point can be maintained or initialized to the process variable parameter value or to the Set Point value associated with the previous retained target mode.
Local Override (LO)	Applies to control and output blocks that support a track input parameter. In the local override mode the block output is being set to track the value of the track input parameter. The algorithm must initialize so that no bump is experienced when the mode switches from LO back to the target mode. The Set Point can be maintained or initialized to the process variable parameter value.
Initialization Manual (IMan)	The block output is set in response to the back-calculation input parameter status. When the status indicates there is no path to the final output element the control blocks must initialize to provide for bumpless transfer when the condition clears. A back-calculation out parameter is supported by all output and control class function blocks. The Set Point can be maintained or initialized to the process variable parameter value.
Out of Service (OOS)	The block is not being evaluated. The output and Set Point are maintained at last value.

Multiple Modes and States

The Analog Output Block (AO) must go to CAS mode to connect to a PID function block in cascade. To prevent the Set Point signal out of the Analog Output Block (AO) from setting the valve position into the transducer block, the Analog Output Block (AO) must go into OOS mode. Table 19 shows several examples of mode operation.

When a block is in OOS mode its output status is bad. Any connected blocks know and automatically change their modes. For example, when a PID block sees bad status in BKCAL IN it goes to IMAN mode for initialization to the downstream block while awaiting the status to return to good cascade.

Examples of IVI Operational States

Examples of operational states that are combinations of block modes are shown in this section. A new device or a newly configured device can start up in the out of service (OOS) state shown in Figure 180.

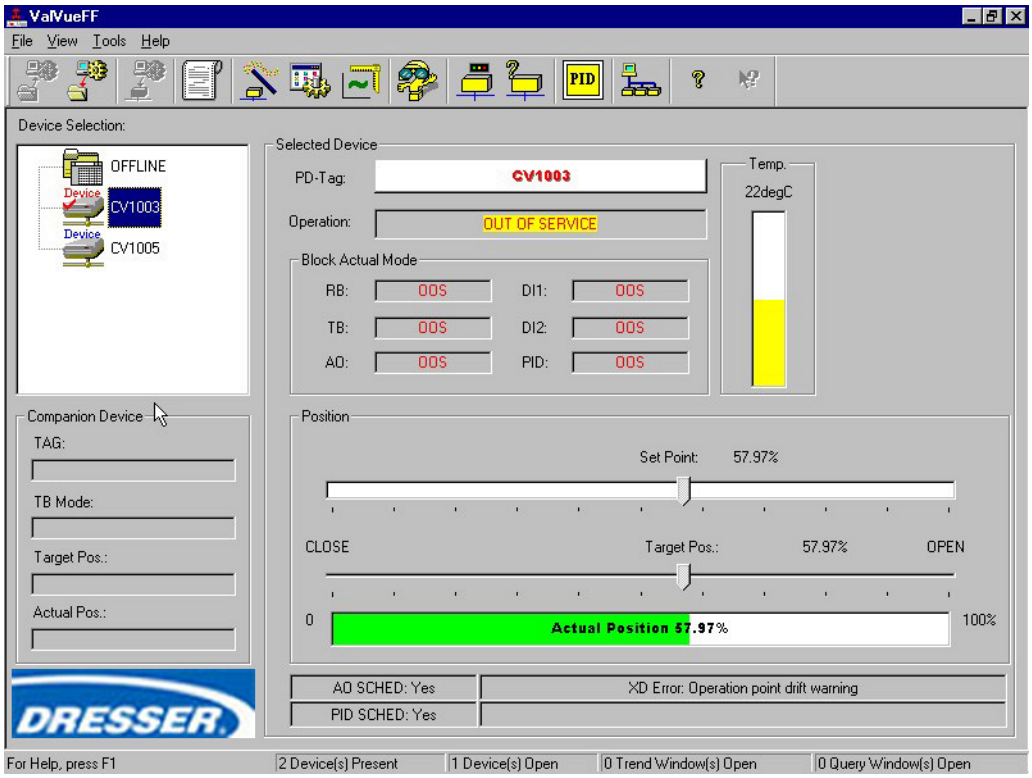

Figure 180 Out of Service at Startup

Table 19 Mode Operation

Operation	(AI)	PID	AO	TB
Configure the transducer block (Auto tuning, travel calibration, diagnostics, etc.)		OOS	OOS	OOS
Configure transducer block (Changing position control parameters, etc.)		OOS	OOS	OOS
Manual valve positioning from ValVueFF or other human interface.				
Manual valve positioning from a PID controller human interface.		Manual	CAS	Auto

Table 19 Mode Operation (Continued)

Operation	(AI)	PID	AO	TB
PID single loop control	Auto	Auto	CAS	Auto
PID cascade loop control	Auto	Primary: Auto Secondary: CAS	CAS	Auto

Transferring to Manual State

Use this procedure to transfer to the manual state which allows ValVueFF to adjust the valve position. The *Device Operation State* dialog box is shown in Figure 179.

1. Select **Tools > Device Operating State** from the drop down menu or select the *Change Device Operation State* icon.
2. Select **Manual**.
3. Enter a *Set Point* or drag the *Set Point* slider to the desire value.
4. Select **OK**. If the positioner is configured with a non-linear (such as *=%*) characteristic the *Target Position* is computed from the *Set Point* but can differ in value. The configuration options of *Tight Shutoff Below*, *Full Open Above*, as well as high and low position limits are applied to the *Set Point* to arrive at the correct *Target Position*.

When the positioner has been placed in normal it waits for the PID block to begin to send it a *Set Point*. It remains in *Auto Mode* at the current valve position. When this condition exists it is necessary to place the PID block in it's normal mode.

When the process control PID is located within the positioner and the PID receives it's *Set Point* from a Foundation Fieldbus function block the normal state is shown in Figure 182. Both the PID and Analog Output Block (AO)s are in Cas mode.

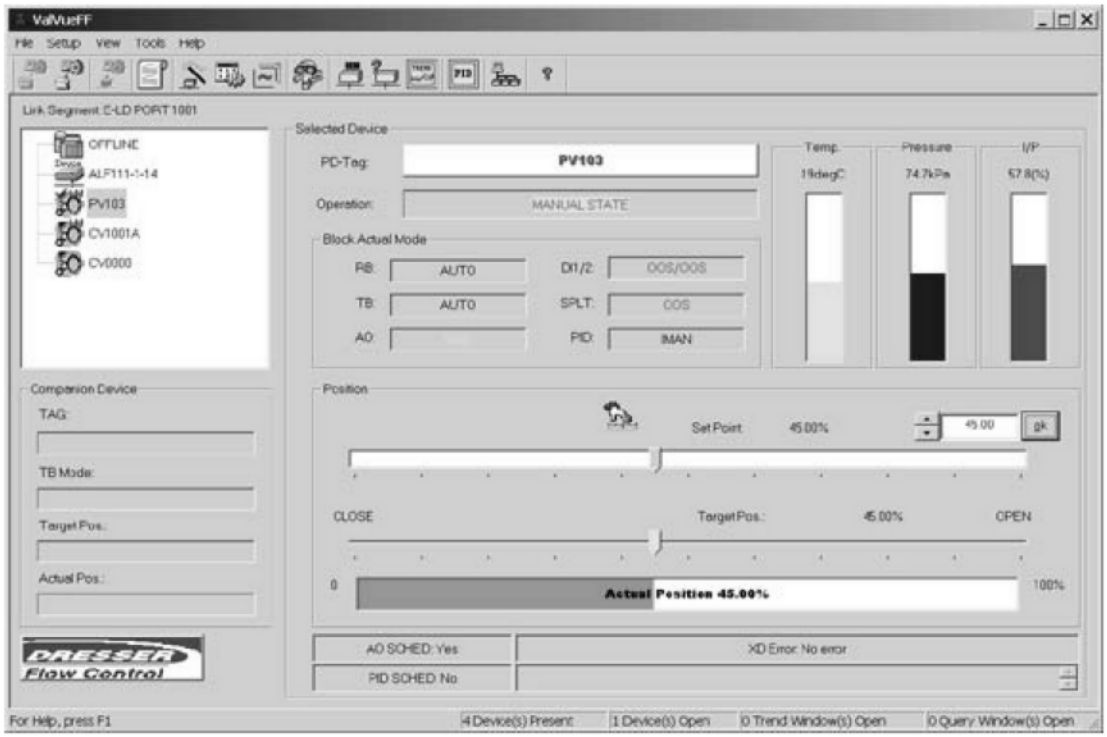

Figure 181 Manual State

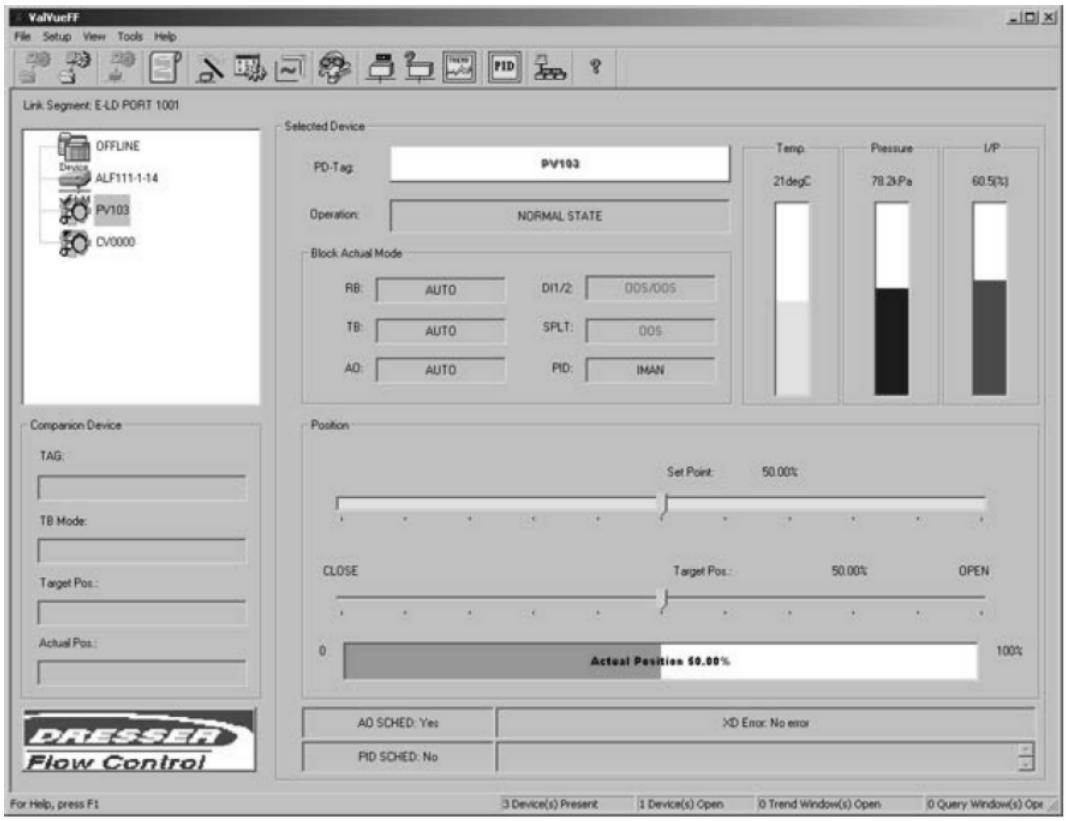

Figure 182 Normal State

RCas Mode

When the positioner is receiving it's position Set Point from a remote computer system, such as a DCS, then the normal state for the positioner is RCas. In this example, the level control valve, LV201, is receiving it's signal from a DCS. The Analog Output Block (AO) is shown in RCas mode.

RCas mode cannot be manually switched to, it is automatically switched to after being configured. For example:

Configure the set point of the positioner in DCS to receive remote data, when the positioner turns to Normal mode, the mode of AO block shows RCas in the *Block Actual Mode* field on the positioner Main page.

PID in RCas Mode

If an internal PID is used in a cascade where the PID receives a Set Point from a remote computer system, then the normal state has the PID in RCas mode and the Analog Output Block (AO) is in Cas mode.

The Foundation Fieldbus Application Process specifies the mode handling for interoperable function blocks. It also specifies which mode a block must be in when each parameter is written. ValVueFF provides an intelligent, optimized, process for managing configuration and calibration changes. For efficiency, it does not place blocks into Out Of Service mode unless the parameter requires OOS. It analyzes the requested changes and then sets the correct mode for each affected function block. The actual block modes appear the IVI.

The Foundation Fieldbus specifies a mechanism for transferring between function block modes. The user declares a target for the block mode but the actual mode is set by the block in accordance with rules. The rules allow modes based on the quality of input data and quality of the connection to the process. FVP function blocks comply with the Fieldbus Foundation rules. ValVueFF sets target modes for individual function blocks as required by configuration, calibration, diagnostics and other services. It sets target modes for a group of function blocks to achieve three operational states of the positioner: Out of Service, Manual, and Normal.

CAUTION

The PID block remains in Out of Service mode after configuration changes are made. After returning to Normal Operating State open the PID dialog box to change the PID block mode. If the AO block is left in Auto mode the valve cannot be moved.

Changing Target Operational State

When a configuration or other process requires any of the affected function blocks to go into OOS mode, ValVueFF opens a *Warning* dialog box (Figure 183).

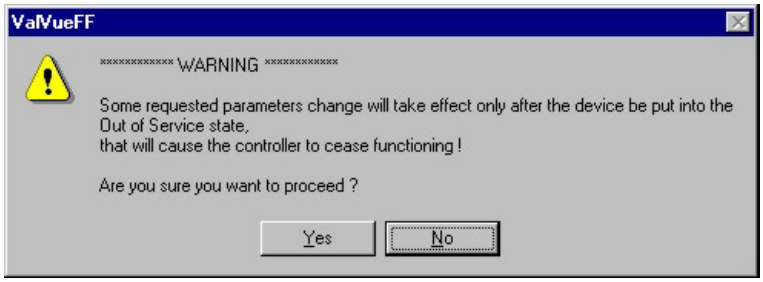
ValVueFF
********** WARNING **********
Some requested parameters change will take effect only after the device be put into the Out of Service state,
that will cause the controller to cease functioning !
Are you sure you want to proceed ?
Yes
No

Figure 183 Out of Service State Change Warning Message Box

Changing to Auto from OOS

In OOS, the FVP can be switched to Auto in order to return the device to the previous Auto state by selecting on Auto. In the event you select bumpless transfer the device executes the bumpless transfer routine.

Fieldbus Resources and References

H

The following companies have web pages and additional information useful for implementing a successful Foundation Fieldbus installation. The links and their content can change without notice.

Belden	www.belden.com
Fieldbus Foundation	Fieldbus Foundation, Inc. 9390 Research Boulevard, Suite II-250 Austin, TX 78759-8780 USA www.fieldbus.org
Fieldbus, Inc.	www.fieldbusinc.com
MTL	www.mtl-inst.com
National Instruments	www.ni.com/fieldbus/
Relcom	www.relcominc.com/fieldbus/tutorial.htm
SMAR	http://www.smar.com/products/az.asp
YEC	http://www.yokogawa.com/au/cp/trainingcentre.htm

Information

Fieldbus Foundation

- ❑ Fieldbus Standard for use in Industrial Control System Part 2: Physical Layer Specifications and Service Definition ISA S50.02-1992
- ❑ International Standard for use in Industrial Control System Part 2: Physical Layer Specifications and Service Definition ICE 61158-2-1993
- ❑ Digital Data Communication for Measurement and Control
- ❑ FOUNDATION Fieldbus Specification, Rev 1.3 Fieldbus Foundation 1994-1998
- ❑ Benefits Observed During Field Trials of Interoperable Fieldbus Foundation #94-504
- ❑ Abstract Syntax Notation One Tutorial and Reference ISBN 1 871802 06 7
- ❑ AG-140 31,.25 kbit/s Wiring and Installation Guide
- ❑ AG-163 31.25 kbit/s Intrinsically Safe System Application Guide
- ❑ AG-165 Fieldbus Installation and Planning Guide
- ❑ FF-800 System Architecture Specification
- ❑ FF-801 Network Management Specification
- ❑ FF-816 31.25 kbit/s Physical Layer Profile Specification
- ❑ FF-818 31.25 kbit/s Fiber Optic Physical Layer Profile
- ❑ FF-821 Data Link Services Subset specifications
- ❑ FF-822 Data Link Layer Protocol Specification
- ❑ FF-880 System Management Specification
- ❑ FF-870 Fieldbus Message Specification
- ❑ FF-875 Fieldbus Access Sublayer Specification
- ❑ FF-890 Function Blocks--Part One
- ❑ FF-891 Function Blocks--Part Two
- ❑ FF-891 Function Blocks--Part Three
- ❑ FF-900 Device Description Language Specification
- ❑ FF-940 31.25 kbit/s Communication Profile
- ❑ FD-100 DDL Tokenizer User Manual
- ❑ FD-110 DDS User Guide
- ❑ FD-200 Conformance Tester User Guide
- ❑ FD-210 Interoperability Tester User Guide

National Instruments

- ❑ Getting Started with Your AT-FBUS and the NI-FBUS Software (322736A-01)
- ❑ NI-FBUS Configurator User Manual (370514F-01)

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